Illinois Environmental Protection Agency

Bureau of Land • 1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276

ILLINOIS EPA RCRA CORRECTIVE ACTION CERTIFICATION

This certification must accompany any document submitted to Illinois EPA in accordance with the corrective action requirements set forth in a facility's RCRA permit. The original and two copies of all documents submitted must be provided.

1.0 Facility Identification

Name: Wood River Refinery
County: Madison
Street Address: 900 South Central Ave.
Site No. (IEPA): 1191150002
City: Roxana, Illinois 62084
Site No. (USEPA): ILD 080 012 305

2.0 Owner Information

Name: Not Applicable
Mail Address:
City:
State: Zip Code:
Contact Name:
Contact Title:
Phone:

3.0 Operator Information

Name: Equilon Enterprises LLC d/b/a Shell Oil Products US
Mail Address: 17 Junction Drive, PMB #399
City: Glen Carbon
State: IL Zip Code: 62034
Contact Name: Kevin Dyer
Contact Title: Senior Principal Program Manager
Phone: 618-288-7237

4.0 Type of Submission (check applicable item and provide requested information, as applicable)

☐ RFI Phase I Workplan/Report
☐ RFI Phase II Workplan/Report
☐ CMP Report;
☒ Other (describe): SVE System CCR Addendum No. 3-4th Street SVE System Extension

IEPA Permit Log No. B-43R
Date of Last IEPA Letter on Project B-43R-CA-65, 68 and 76
Log No. of Last IEPA Letter on Project 04/19/2014

Does this submittal include groundwater information: ☐ Yes ☒ No

Date of Submittal:

5.0 Description of Submittal: (briefly describe what is being submitted and its purpose)

Construction Completion Report Addendum for a Soil Vapor Extraction System Extension constructed on three SOPUS-owned parcels located at 146, 147 & 150 East 4th Street in Roxana, Illinois.

6.0 Documents Submitted (identify all documents in submittal, including cover letter; give dates of all documents)

Cover Letter, RCRA Corrective Action Certification, and SVE System Construction Completion Report Addendum

7.0 Certification Statement

(This statement is part of the overall certification being provided by the owner/operator, professional and laboratory in Items 7.1, 7.2 and 7.3 below). The activities described in the subject submittals have been carried out in accordance with procedures approved by Illinois EPA. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

For: Equilon Enterprises LLC d/b/a Shell Oil Products US

Date of Submission: _____

7.1 Owner/Operator Certification

(Must be completed for all submittals. Certification and signature requirements are set forth in 35 IAC 702.126.) All submittals pertaining to the corrective action requirements set forth in a RCRA Permit must be signed by the person designated below (or by a duly authorized representative of that person):

1. For a Corporation, by a principal executive officer of at least the level of vice president.
2. For a Partnership or Sole Proprietorship, by a general partner or the proprietor, respectively.
3. For a Governmental Entity, by either a principal executive officer or a ranking elected official.

A person is a duly authorized representative only if:

1. the authorization is made in writing by a person described above; and
2. the written authorization is provided with this submittal (a copy of a previously submitted authorization can be used).

Owner Signature: _____ Date: _____

Title: _____

Operator Signature: Kevin Eddy Date: 2/2/15

Title: Senior Principal Program Manager

7.2 Professional Certification (If necessary)

Work carried out in this submittal or the regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. No one is relieved from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44 (h))

Professional's Signature: _____ Date: 1/26/2015

Professional's Name: Steven P. Tierney

Address: URS Corporation / 345 East Ash Avenue

City: Decatur

State: IL Zip Code: 62704

Phone: 217-875-4800

Professional's Seal:

7.3 Laboratory Certification (If necessary)

The sample collection, handling, preservation, preparation and analysis efforts for which this laboratory was responsible were carried out in accordance with procedures approved by Illinois EPA.

Name of Laboratory _____

_____ Date: _____

Signature of Laboratory Responsible Officer

Mailing Address of Laboratory

Address _____

City _____

State _____ Zip Code _____

_____

Name and Title of Laboratory Responsible Officer

AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110-1337
www.aecom.com

314 429 0100 tel
314 429 0462 fax

March 4, 2015

Mr. James K. Moore, P.E.
Illinois Environmental Protection Agency
Bureau of Land
1021 North Grand Avenue
Springfield, Illinois 62794

SVE System Construction Completion Report Addendum No. 3
4th Street SVE System Extension
Equilon Enterprises LLC d/b/a Shell Oil Products US
Roxana, Illinois
1191150002 – Madison County
ILD 080 012-305
Log No. B-43R

Dear Mr. Moore:

AECOM (formerly URS Corporation), on behalf of Shell Oil Products US (SOPUS), is submitting the enclosed SVE System Construction Completion Report (CCR) Addendum No. 3. This CCR documents the extension of the system onto three SOPUS-owned parcels located at 146, 147 and 150 East 4th Street in Roxana, Illinois.

If you have any questions concerning this report, please contact Kevin Dyer, SOPUS Senior Principal Program Manager at (618) 288-7237 or kevin.dyer@shell.com, or Nicholas Eldred at (314) 743-7753 or nicholas.eldred@aecom.com

Effective January 5, 2015, AECOM and URS have joined together as one company and is now operating as AECOM. The attached report was prepared prior to January 5, 2014. References to URS within the document shall imply AECOM.

Sincerely,

Nicholas Eldred
Senior Project Manager

cc: Kevin Dyer, SOPUS
Gina Search, IEPA-Collinsville
Shannon Haney, Greensfelder, Hemker & Gale, P.C.
Roxana Repositories (Library, Public Works, Website)

REPORT

SVE SYSTEM CONSTRUCTION COMPLETION REPORT ADDENDUM NO. 3 – 4TH STREET SVE SYSTEM EXTENSION

Located at:

146, 147 and 150 EAST 4th STREET

ROXANA, ILLINOIS

Prepared for
Shell Oil Products US
17 Junction Drive
PMB#399
Glen Carbon, IL 62034

January 2015

URS Corporation
1001 Highland Plaza Drive West, Suite 300
St. Louis, MO 63110
(314) 429-0100
Project # 21563720.19000

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On behalf of Shell Oil Products US (SOPUS), ongoing work is being conducted by URS Corporation (URS) within the Village of Roxana, Illinois (Village). The work area is generally bounded by Illinois Route 111 to the west, the West Fenceline of the Wood River Refinery (WRR) to the east, East 1st Street to the north, Rand Avenue to the south, and within the WRR along the West Fenceline (**Figure 1**). At the request of SOPUS, URS designed, constructed and currently operates a Soil Vapor Extraction (SVE) system (System) along the West Fenceline of the WRR North Property, in the Village, and within the Village Public Works (PW) Yard (**Figure 2**).

This report documents the extension of the System onto three vacant parcels owned by SOPUS located at 146, 147, and 150 East 4th Street within the Village (4th Street SVE System Extension). The purpose of this Construction Completion Report (CCR) Addendum (Addendum No. 3) is to provide information regarding System layout and construction activities for the 4th Street SVE System Extension. The construction area for the 4th Street SVE System Extension discussed in this document is presented on **Figure 3**.

Cone Penetration Testing (CPT) and Rapid Optical Screening Tool (ROST™) data collected during May, 2013, from three SOPUS owned parcels located at 146, 147, and 150 East 4th Street within the Village indicated residual petroleum hydrocarbon impact within fine grained soils beneath the parcels. To address this, SOPUS began evaluating remedial technologies which could be implemented on the parcels.

A pilot test was conducted as part of the implementation of the *Air Sparging and Soil Vapor Extraction Pilot Test – East 4th Street and Chaffer Street Work Plan*, submitted to the IEPA on August 16, 2013. This pilot test was performed to evaluate the viability of adding air sparging (AS) coupled with an extension of the SVE system to enhance the performance of the existing SVE system in the vicinity of East 4th Street and Chaffer Street. The results of this pilot test indicated that the geology of the proposed test area would impede sufficient recovery of sparge air and therefore, the air sparge technology was chosen not to be advanced. A summary of observations and results of the pilot test are provided in **Appendix A**.

Based on the results of the pilot test, SOPUS decided to move forward with the installation of additional SVE wells and extend the existing SVE system onto the three vacant parcels. At the request of SOPUS, URS developed a conceptual design for the extension of the existing SVE System which was presented in the *Conceptual Design, SVE System Extension, East 4th and Chaffer Streets* (Conceptual Design), dated July 2014 and is provided in **Appendix B**.

The extension of the SVE System detailed in the Conceptual Design, recommended that six additional SVE Wells (SVE-42 through SVE-47) be installed on the SOPUS-owned parcels. The spacing of the wells is based on a design radius of influence (ROI) of 60 feet for SVE-42, 43, 44, 46, and 47, which is consistent with the ROI used for design of the West Fenceline portion of the SVE System as documented in the June 2011 *Conceptual/Final Design Report*. The effective ROI of at least 60 feet has been confirmed through ongoing system operation and monitoring. The design ROI for SVE-45 was assumed to be 30 feet since this well is screened within a smaller interval to target impacts within and below a silty sand layer. The location of each SVE well was selected based on evaluation of CPT and ROST™ data gathered from 12 CPT/ROST™ soil borings (ROST-31 through ROST-42) completed on the parcels in May 2013 and from three CPT/ROST™ borings (ROST-5, ROST-8, and ROST-9) completed within the public rights-of-way adjacent to the parcels in August 2009 (prior to System start-up). In addition, soil vapor screening data, soil vapor laboratory analytical data, and System vacuum data collected monthly from numerous VMPs located in the vicinity of the parcels were used to assist in determining the locations of the proposed SVE wells. CPT/ROST™ and VMP locations are presented in **Figure 3.**

The six new SVE wells are an extension of the existing System "blue line" (**Figure 4** and **Figure 5**). The existing blue line wells (SVE wells SVE-3R, 4, 10, 11, 12, and 25) are interconnected by aboveground 4-inch diameter carbon steel piping on the WRR North Property and underground 4-inch diameter high density polyethylene (HDPE) piping in East 4th and Chaffer Streets. The new wells were completed in below grade vaults and connected to the existing piping using underground 4-inch diameter HDPE piping. Wells SVE-42 through SVE-45, installed in the parcels north of East 4th Street, are connected to a common header, which connects to the existing "blue line" piping within the SVE-3R/SVE-25 well vault. Wells SVE-46 and SVE-47, installed in the parcel south of East 4th Street, are connected to a common header, which connects to the existing "blue line" piping in the center of East 4th Street. The underground HDPE piping was installed with tracer wire to facilitate future line location.

Original Final Design Drawings and Technical Specifications for the SVE System Extension are provided in **Appendix C** and **Appendix D**, respectively.

There were no significant deviations from the Conceptual Design (**Appendix B**), Final Design Drawings (**Appendix C**), or Technical Specifications (**Appendix D**) during construction of the 4th Street SVE System Extension.

URS contracted Roberts Environmental Drilling, Inc. (REDI) of Millstadt, Illinois to install the SVE wells. Korte & Luitjohan Contractors, Inc. (K&L), of Highland, Illinois was contracted by URS to conduct installation of the piping and well vaults.

5.1 SVE Well Installation Activities

4th Street SVE System Extension wells SVE-42 through SVE-47 were installed from July 29, 2014 through August 19, 2014. The following subsections provide a brief description of the well installation activities that were performed. SVE well locations are shown on **Figures 4 and 5**.

5.1.1 Pre-field Activities and Borehole Clearance

Prior to the start of work, the well locations were marked in the field with spray paint. A utility locate was arranged using Illinois' Joint Utility Locating Information for Excavators (JULIE) service. While JULIE provided identification of public utility lines, REDI was contracted to perform private utility locating services using ground penetrating radar (GPR) and electromagnetic (EM) technologies at each location.

Borehole clearance via an air-vacuum system (air-knife) operated by REDI was then used to clear each boring location to a depth of 10 feet below ground surface (bgs) with respect to underground utility lines or other obstructions.

Subsurface material observations were made during borehole clearance activities by advancing a hand auger prior to air-knifing to collect grab samples for field-screening and soil classification. An iterative process was used. A soil sample was collected via hand auger, the air knife was used to advance the borehole approximately one foot, and then these steps were repeated to a depth of 10 feet. Observations were noted on the soil boring logs (**Appendix E**).

5.1.2 Drilling and Soil Sampling

Drilling, sampling and well installation activities were performed by REDI. Drilling and soil sampling was performed with a CME-75 drill rig using 6.25-inch inside diameter (ID) hollow stem augers and split spoon samplers. Soil sampling was conducted via a split spoon sampler advanced in two-foot increments just below the lead auger. The subsurface stratigraphy was continuously logged by a qualified field scientist in accordance with applicable ASTM standards and the Unified Soil Classification System (USCS). The field scientist noted soil attributes such as color, particle size, consistency, moisture content, structure, plasticity, odor (if obvious), and organic content (if visible). Soil samples were screened in the field using a photoionization detector (PID). Observations were noted on the soil boring logs (**Appendix E**). Soil borings were completed to depths ranging from 26-43 feet below ground surface (bgs). The total depth

of each SVE well and soil boring was predetermined based on ROST™ and CPT data previously collected from the three parcels during an investigations performed in May 2013 and August 2009.

One discrete soil sample was collected for laboratory analysis from the each boring from a depth within the screened interval of each SVE well.

5.1.3 SVE Well Installation

Upon completion of soil boring and sample collection, an SVE well was installed through the augers. Each well was constructed using a 4-inch diameter Schedule 40 PVC casing, with a 5-foot or 10-foot section of 0.010-inch slotted PVC well screen. The well screens were set from 25 to 35 feet bgs in wells SVE-42 through SVE-44, from 37 to 42 feet bgs in well SVE-45, and from 15 to 25 feet bgs in wells SVE-46 and SVE-47. Screened intervals were predetermined based on the May 2013 and August 2009 ROST™ and CPT data (**Appendix B**). The sand pack of each well consisted of silica filter sand placed within the annular space and extended to approximately 2 feet above the top of the well screen. A bentonite seal approximately 3 feet thick was placed above the sand pack. The borehole annulus was then grouted to approximately 4 feet bgs with cement-bentonite grout. Wells SVE-42 through SVE-47 were completed in below grade vaults and connected to an extension of the existing "blue line" SVE header located in East 4th Street. A summary of well construction details is provided in **Table 1** and well construction diagrams for each well are provided in **Appendix E**.

5.1.4 Sample Handling, Laboratory Testing and Results

Soil samples were collected from within each soil boring in laboratory-supplied containers appropriate for the test method and labeled in the field. Pertinent sample information was recorded on the chain of custody (COC) form at the time of sample collection. The COCs can be found with the analytical report in **Appendix F**.

Upon collection and labeling, sample containers were immediately placed inside an iced cooler, packed in such a way as to prevent breakage and maintain an inside temperature at or below 4^{o} C. The samples were then delivered via overnight courier, under the proper COC documentation, to the laboratory for analysis.

A total of 8 soil samples (6 investigative soil samples, 1 field duplicate soil sample, 1 soil matrix spike and matrix spike duplicate (MS/MSD)), 1 aqueous field equipment blank, and six aqueous VOC trip blank sets were prepared and sent to Accutest Laboratories in Marlborough, Massachusetts. Samples were submitted for the following analysis:

- Method 8260B VOCs
- Method 8011 VOCs
- Method 8270 SVOCs
- Method 8270C SIM – Low Level PAHs
- Method 8015 TPH-GRO

Up to the top 15 tentatively identified compounds (TICs)[1] were also identified with the Method 8260B VOC analysis.

A tabular summary of the analytical detections for the soil samples collected during SVE well installation activities is presented in **Table 2**. **Appendix F** contains URS Data Reviews and the laboratory reports with chain of custody forms for the soil data.

5.1.5 Investigation Derived Waste

Investigation derived waste (IDW), including soil cuttings, personal protective equipment (PPE) and expendable materials, along with decontamination water, was collected and disposed of properly. Expendable materials (e.g., disposable sampling equipment such as gloves) having a low probability of impact were collected in trash bags and disposed of as municipal waste. Soil cuttings from the borings were collected and placed directly in a labeled and covered roll-off box managed by URS on behalf of SOPUS. The roll off box was staged inside an area secured by temporary fencing located on the 150 East 4th Street parcel. Upon completion of drilling activities, the roll-off box was removed from the 150 East 4th Street parcel, and the soil was disposed via an existing non-hazardous waste profile at the Waste Management, Inc. Milam Recycling and Disposal Facility in Fairmont City, Illinois. Decontamination fluids were also collected and containerized in 55-gallon DOT-approved drums secured in the garage located at 150 East 4th Street. Decontamination fluids were then disposed via an existing non-hazardous waste profile at the Heritage Environmental, LLC facility in Indianapolis, Indiana.

5.2 Installation of SVE System Extension Piping

Prior to conducting construction activities on public right-of-way, a Fourth Amendment to the existing Access Agreement between the Village and SOPUS was prepared. Village Ordinance No. 969, approving the Fourth Amendment to the Access Agreement, was subsequently passed on August 4, 2014.

[1] TICs reported are those present at levels above 10 percent of associated internal standard responses.

URS contracted K&L to complete construction activities associated with the installation of the SVE System Extension piping. Construction field activities for installation of the SVE System Extension piping and well vaults were performed between September 23, 2014 and October 24, 2014.

Four-inch diameter HDPE piping was placed in trenches excavated to a depth so as to provide a minimum of 26 inches of cover over the pipe placed within the SOPUS-owned parcels, a minimum of 28 inches of cover over the pipe placed beneath the sidewalk and East 4th Street, and a minimum slope of ¼-inch for every ten horizontal feet of pipe. The HDPE pipe was bedded with a minimum of four inches of sand below and six inches of sand above the pipe. On the SOPUS-owned parcels, existing soil was used as the backfill material from the top of the sand to the ground surface. The existing soil backfill was placed in nine inch lifts and each lift was mechanically compacted. The portions of the HDPE piping trench excavations that extended beyond the SOPUS-owned property (i.e., across the sidewalk and into East 4th Street) were backfilled with flowable fill from the top of the sand to a depth of approximately 4 inches bgs. Concrete was poured to replace portions of sidewalk and the East 4th Street curb and gutter that were removed for construction. A 4-inch layer of asphalt was placed to match the existing East 4th Street pavement.

A 36-inch by 36-inch steel vault was placed over each SVE well such that the surface of the vault was approximately 5/8-inch higher than the final grade. The HDPE piping is connected to each SVE well inside the vault via an HDPE to PVC transition piece, which is then connected to a 4-inch PVC flange. The PVC flange is connected to a PVC ball valve and a second PVC flange, which is connected to a PVC tee attached at the top of the SVE well. The vaults were placed on a minimum of eight inches of IDOT (Illinois Department of Transportation) CA7 graded aggregate. CA7 was placed around the vaults to a depth of ten inches bgs. A 10-inch wide concrete apron was poured around the vault from the top of the CA7 aggregate to the existing ground surface.

The HDPE pipe for SVE wells SVE-42, 43, 44, and 45 is connected to the previously existing "blue line" inside the vault housing existing wells SVE-3R and SVE-25. The HDPE pipe for SVE wells SVE-46 and 47 is connected to the existing "blue line" HDPE lateral, which runs east to west in the center of East 4th Street.

The HDPE conveyance pipe was pressure tested on October 16, 2014 and October 21, 2014. No leaks were detected during the tests. Field pressure test certification documents are provided in **Appendix G**.

Upon completion of the construction activities, construction fencing and barriers were removed, and the site was graded, seeded and covered with straw. URS began commissioning of the SVE System Extension on November 5, 2014, with all SVE System Extension wells online by November 7, 2014. Commissioning was completed and full-scale operation of this part of the System began on December 5, 2014.

Plan views of the entire SVE System, including the 4th Street Extension, are presented in **Figures 4** and **5**. Detailed as-built drawings of the 4th Street Extension (**Figures AB-1** and **AB-2**) are included in **Appendix H**. Photographs of construction activities are included in **Appendix I.**

URS personnel provided oversight during the construction and installation of the 4th Street SVE System Extension to monitor, document, and assure construction activities and performance met the intent of the design specifications. Oversight activities included layout, documentation of installation, and observation of field construction activities. Additionally, the on-site URS representative monitored the contractor's compliance with QA/QC requirements.

Daily on-site construction observation was performed by URS field representatives and K&L's on-site QA/QC representatives. The construction and installation activities performed by URS' contractors for the 4th Street SVE System Extension were in general conformance with the Conceptual Design, Final Design Drawings and Technical Specifications.

Operation and Maintenance of the entire SVE System is performed in accordance with the *SVE Operating and Maintenance (O&M) Plan, WRB Refining LP, Roxana Public Works Site, Revision 5,* updated December, 2014 (**Appendix J**). The O&M plan is updated on an as needed basis.

The information and conclusions presented in this Report are professional opinions based solely upon the data described in this report. They are intended exclusively for the purpose outlined herein and the Site location and project indicated. This report is for the sole use and benefit of SOPUS. The scope of services performed in execution of this effort may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user. No express or implied representation or warranty is included or intended in this report except that the work was performed within the limits prescribed by SOPUS with the customary thoroughness and competence of professionals working in the same area on similar projects.

Illinois Environmental Protection Agency (IEPA). July 14, 2011. *Joint Construction and Operating Permit*

Shell Oil Products US. June 2011. *Conceptual/Final Design Report.* Prepared by URS Corporation.

Shell Oil Products US. May 2012. *SVE System Construction Completion Report.* Prepared by URS Corporation.

Shell Oil Products US. February 2013. *SVE System Construction Completion Report Addendum.* Prepared by URS Corporation.

Shell Oil Products US. August 2013. *Air Sparging and Soil Vapor Extraction Pilot Test – East 4th Street and Chaffer Street.* Prepared by URS Corporation.

Shell Oil Products US. October 2013. *Soil Vapor Sampling and SVE Monitoring Report – 3rd Quarter 2013.* Prepared by URS Corporation.

Shell Oil Products US. January 2014. *SVE System Construction Completion Report Addendum No. 2 – SVE Extension.* Prepared by URS Corporation.

Battelle, December 2001. *Helium Tracer Test for Assessing Air Recovery and Distribution,* Johnson R.L. ET. Al.

Battelle, August 2002. *Air Sparging Design Paradigm,* Leeson. et.al.

Table 1
SVE Well Construction

WELL ID	COMPLETION DATE	COORDINATES		GROUND ELEVATION (feet)	SCREEN INTERVAL (feet bgs)	TOTAL WELL DEPTH	TOTAL BORING DEPTH
		Northing	Easting				
SVE-42	09/13/13	793428.34	2322228.28	442.08	25-35	35.25	36
SVE-43	09/16/13	793428.73	2322147.36	442.12	25-35	35.25	36
SVE-44	09/17/13	793332.43	2322146.79	442.46	25-35	35.25	36
SVE-45	09/18/13	793340.07	2322208.17	442.58	37-42	42.25	43
SVE-46	09/19/14	793260.69	2322209.79	442.85	15-25	25.25	26
SVE-47	09/19/13	793164.39	2322212.17	444.01	15-25	25.25	26

NOTES:

1) Ground elevation measured approximately 4" north of well vault.

2) Screen interval and total well/boring depth recorded at time of drilling.

SEE LAST PAGE OF TABLE FOR NOTES

TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

Location	Sample ID	Depth	Sample Date	VOCs													
				Benzene (mg/kg)			n-Butylbenzene (mg/kg)			sec-Butylbenzene (mg/kg)			Cymene (p-Isopropyltoluene) (mg/kg)			Ethylbenzene (mg/kg)		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	< 0.087	U		1.46			< 0.87	U		< 0.87	U		1.38		
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	< 0.071	U		0.648	J		0.573	J		0.162	J		< 0.28	U	
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	0.00085			< 0.0061	U		< 0.0061	U		< 0.0061	U		0.0016	J	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	< 0.064	U		3.66			0.605	J		0.344	J		21.4		
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	0.001			< 0.0059	U		< 0.0059	U		< 0.0059	U		0.002	J	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	0.00083			< 0.0059	U		< 0.0059	U		< 0.0059	U		0.0016	J	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	< 1.3	U		19.1			< 13	U		< 13	U		155		

SEE LAST PAGE OF TABLE FOR NOTES

TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOCs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Isopropylbenzene (Cumene) (mg/kg)**			**Naphthalene (mg/kg)**			**n-Propylbenzene (mg/kg)**			**Toluene (mg/kg)**			**1,2,4-Trimethylbenzene (mg/kg)**	
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	0.455	J		2.26			1.22			< 0.87	U		7.03		
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	0.307	J		< 0.71	U		0.569	J		< 0.71	U		< 0.71	U	
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	< 0.0061	U		< 0.0061	U		< 0.0061	U		0.0022	J	J	< 0.0061	U	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	2.08			3.79			6.58			7.76			33.7		
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	< 0.0059	U		< 0.0059	U		< 0.0059	U		0.0025	J		< 0.0059	U	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	< 0.0059	U		< 0.0059	U		< 0.0059	U		0.0022	J		< 0.0059	U	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	13.6			26.3			40.5			320			179		

SEE LAST PAGE OF TABLE FOR NOTES

TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOCs												VOC TICs		
Location	**Sample ID**	**Depth**	**Sample Date**	**1,3,5-Trimethylbenzene (mg/kg)**			**m,p-Xylenes (mg/kg)**			**o-Xylenes (mg/kg)**			**Xylenes (total) (mg/kg)**			**1H-Indene, 2,3-dihydro-1,1,3-trimethyl- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	1.89			3.41			1.83			5.24					
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	< 0.71	U		< 0.28	U		< 0.28	U		< 0.28		U	1.6	JN	
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	< 0.0061	U		0.00077	J		< 0.0024	U		0.0011		J			
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	9.38			49.2			18.6			67.8					
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	< 0.0059	U		0.00094	J		0.00043	J		0.0014		J			
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	< 0.0059	U		0.00081	J		< 0.0024	U		0.0011		J			
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	46.1			355			154			509					

SEE LAST PAGE OF TABLE FOR NOTES

TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**1H-Indene, 2,3-dihydro-1,6-dimethyl- (mg/kg)**			**1H-Indene, 2,3-dihydro-4,7-dimethyl- (mg/kg)**			**2-Indanol (mg/kg)**			**3-Phenylbut-1-ene (mg/kg)**			**Benzene, (1-methyl-1-propenyl)-, (Z)- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014				5	JN									
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	6.3	JN		1.9	JN								1.7	JN
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014														
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014							10	JN						
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014														
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014														
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014										56	JN			

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Benzene, 1,2,3,5-tetramethyl- (mg/kg)**			**Benzene, 1,2,3-trimethyl- (mg/kg)**			**Benzene, 1,2,4,5-tetramethyl- (mg/kg)**			**Benzene, 1-butenyl-, (E)- (mg/kg)**			**Benzene, 1-ethyl-2-methyl- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	1.6	JN		2.5	JN					2.4	JN		3.8	JN	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014															
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014															
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014				9.8	JN		7.3	JN					9.3	JN	
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014															
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014															
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014				60	JN								54	JN	

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

Location	Sample ID	Depth	Sample Date	VOC TICs														
				Benzene, 1-ethyl-3,5-dimethyl- (mg/kg)			Benzene, 1-ethyl-3-methyl- (mg/kg)			Benzene, 1-ethyl-4-methyl- (mg/kg)			Benzene, 1-methyl-2-(1-methylethyl)- (mg/kg)			Benzene, 1-methyl-3-(1-methylethyl)- (mg/kg)		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	2.9	JN					2.3	JN					1.8	JN	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014										2.2	JN				
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014															
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014				19	JN		8.7	JN							
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014															
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014															
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014				130	JN										

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Benzene, 2-ethyl-1,4-dimethyl- (mg/kg)**			**Benzene, 4-ethyl-1,2-dimethyl- (mg/kg)**			**Butane (mg/kg)**			**Butane, 2,2,3,3-tetramethyl- (mg/kg)**			**Cyclohexane, 1-ethyl-4-methyl-, trans- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014				2.9	JN									
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014				2.3	JN								2.5	JN
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014							0.027	JN						
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014				7.3	JN					32	JN			
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014														
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014														
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	38	JN												

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Cyclopentane, methyl- (mg/kg)**			**Decane, 4-methyl- (mg/kg)**			**Dodecane (mg/kg)**			**Heptane (mg/kg)**			**Heptane, 4-methyl- (mg/kg)**	
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014							4.5	JN						
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014				2.1	JN								2.2	JN
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014														
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014														
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014														
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014														
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	61	JN								49	JN			

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Hexane (mg/kg)**			**Hexane, 2,2,5,5-tetramethyl- (mg/kg)**			**Hexane, 2,2,5-trimethyl- (mg/kg)**			**Hexane, 2,4-dimethyl- (mg/kg)**			**Hexane, 2,5-dimethyl- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014														
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014				1.6	JN									
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014														
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014							6.2	JN		7.8	JN		11	JN
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014														
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014														
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	54	JN												

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Hexane, 2-methyl- (mg/kg)**			**Hexane, 3-methyl- (mg/kg)**			**Isobutane (mg/kg)**			**Isopentane (mg/kg)**			**Naphthalene, decahydro- (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014														
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014													4.3	JN	
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014							0.012	JN		0.013	JN				
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014															
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014															
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014															
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	49	JN		48	JN										

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Nonane (mg/kg)**			**9-Octadecenamide, (Z)- (mg/kg)**			**Octane, 2,6-dimethyl- (mg/kg)**			**Octane, 4-methyl- (mg/kg)**			**Pentane (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	1.8	JN												
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014							3.4	JN						
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014				0.56	JN								0.007	JN
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014										42	JN			
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014														
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014														
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	34	JN												

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

Location	Sample ID	Depth	Sample Date	VOC TICs														
				Pentane, 2,3,4-trimethyl- (mg/kg)			Pentane, 2,3-dimethyl- (mg/kg)			Pentane, 2-methyl- (mg/kg)			Pentane, 3-ethyl-2-methyl- (mg/kg)			Tridecane (mg/kg)		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014													2	JN	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014															
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014															
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	28	JN		15	JN		2.5	JN							
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014															
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014															
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	60	JN								110	JN				

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				VOC TICs									SVOCs					
Location	**Sample ID**	**Depth**	**Sample Date**	**Undecane (mg/kg)**			**Unknown (mg/kg)**			**Unknown Benzene (mg/kg)**			**Acenaphthene (mg/kg)**			**Acenaphthylene (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	4.3	JN					4	JN		< 0.0059	U		< 0.0059	U	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014										0.238			0.0517		
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014										< 0.005	U		< 0.005	U	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014										0.0103			0.0035	J	
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014										< 0.005	U		< 0.005	U	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014										< 0.005	U		< 0.005	U	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014				64	JN		58	JN		0.0739			0.0345		

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				SVOCs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Anthracene (mg/kg)**			**Benzo(a)anthracene (mg/kg)**			**Benzo(a)pyrene (mg/kg)**			**Benzo(b)fluoranthene (mg/kg)**			**Benzo(g,h,i)perylene (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	< 0.0059	U		< 0.0059	U		< 0.0059	U		< 0.0059	U		< 0.0059	U	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	0.189			0.023			0.0036	J		0.0046	J		< 0.0058	U	
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	< 0.005	U		< 0.005	U		< 0.005	U		< 0.005	U		< 0.005	U	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	0.0056	J		< 0.0058	U		< 0.0058	U		< 0.0058	U		< 0.0058	U	
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	< 0.005	U		< 0.005	U		< 0.005	U		< 0.005	U		0.0031	J	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	< 0.005	U		< 0.005	U		< 0.005	U		< 0.005	U		< 0.005	U	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	0.024	J		< 0.031	U		< 0.031	U		< 0.031	U		< 0.031	U	

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

				SVOCs													
Location	**Sample ID**	**Depth**	**Sample Date**	**Chrysene (1,2-Benzphenanthracene) (mg/kg)**			**Dimethyl phthalate (mg/kg)**			**Fluoranthene (mg/kg)**			**Fluorene (mg/kg)**			**1-Methylnaphthalene (mg/kg)**		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	< 0.0059	U		< 0.29	U		< 0.0059	U		< 0.0059	U		< 0.012	U	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	0.0446			< 0.29	U		0.0589			0.373			2.82		
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	< 0.005	U		< 0.25	U		< 0.005	U		< 0.005	U		< 0.01	U	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	< 0.0058	U		< 0.29	U		0.004	J		0.0149			0.747		
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	< 0.005	U		< 0.25	U	UJ	< 0.005	U		< 0.005	U		< 0.01	U	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	< 0.005	U		< 0.25	U		< 0.005	U		< 0.005	U		< 0.0099	U	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	< 0.031	U		0.0431	J		0.0237	J		0.0947			6.65		

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TABLE 2
4th STREET SVE EXTENSION:
SUMMARY OF ANALYTES DETECTED

Location	Sample ID	Depth	Sample Date	SVOCs									Hydrocarbons		
				2-Methylnaphthalene (mg/kg)			Phenanthrene (mg/kg)			Pyrene (mg/kg)			TPH-GRO (VOA) (mg/kg)		
				Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals	Result	Lab Quals	URS Quals
SVE-42	SVE42-080514(32-34')	32 - 34 ft	8/5/2014	0.0013	J		< 0.0059	U		< 0.0059	U		12.2	J	
SVE-43	SVE43-080814 (30-32')	30 - 32 ft	8/8/2014	< 0.012	U		1.56			0.144			156		
SVE-44	SVE44-082014(30-36')	30 - 36 ft	8/20/2014	0.0012	J		< 0.005	U		< 0.005	U		2.55	J	
SVE-45	SVE45-080614 (40-42')	40 - 42 ft	8/6/2014	1.63			0.0242			0.0067			249		
SVE-46	SVE46-080414(18-22')	18 - 22 ft	8/4/2014	< 0.01	U		< 0.0016	JB	U	< 0.005	U		< 13	U	
SVE-46	SVE46-080414(18-22')-DUP	18 - 22 ft	8/4/2014	< 0.0099	U		< 0.005	U		< 0.005	U		< 13	U	
SVE-47	SVE47-080114 (22-24')	22 - 24 ft	8/1/2014	12.1			0.112			0.0319			276		

Laboratory Qualifiers

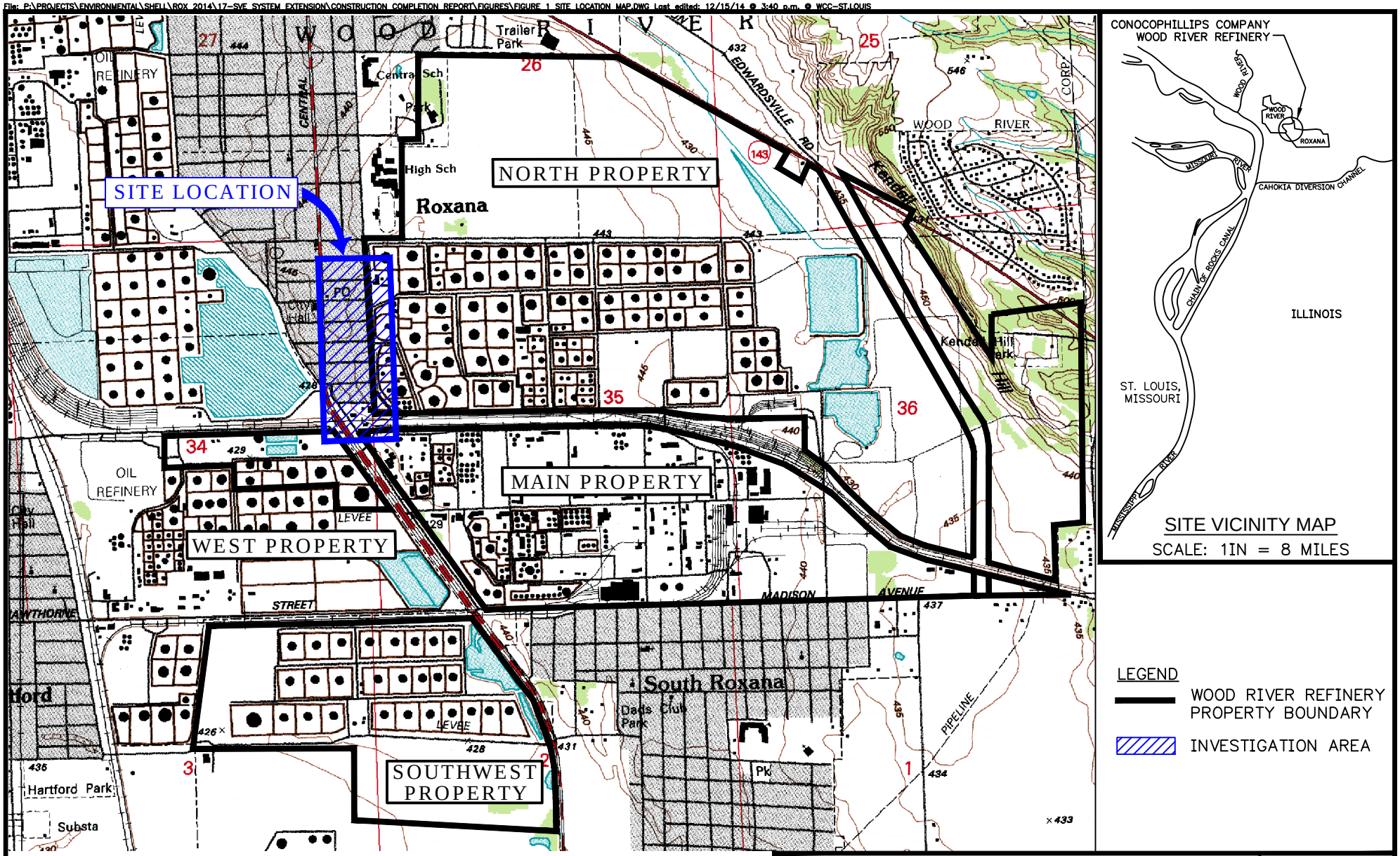
< "U" = Not detected at the reporting limit.
J = The analyte was detected below the reporting limit. Result is estimated.
JN = Estimated value for tentatively identified compound (TICs). (library search)
B = Analyte is detected in the method blank.

Note: Library searches for TICs are used to look for the presence of non-target analytes.
TICs reported are those present at levels above ten percent of associated internal standard responses.

URS Qualifiers

J **=** The result is estimated.
UJ = The result is estimated non-detect.

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE 1 SITE LOCATION MAP.DWG Last edited: 12/15/14 @ 3:40 p.m. @ WCC-ST.LOUIS



SOURCE:
MAP TAKEN FROM ELECTRONIC USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE TOPOGRAPHIC MAP OF WOOD RIVER, ILL-MO REVISED 1994.

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

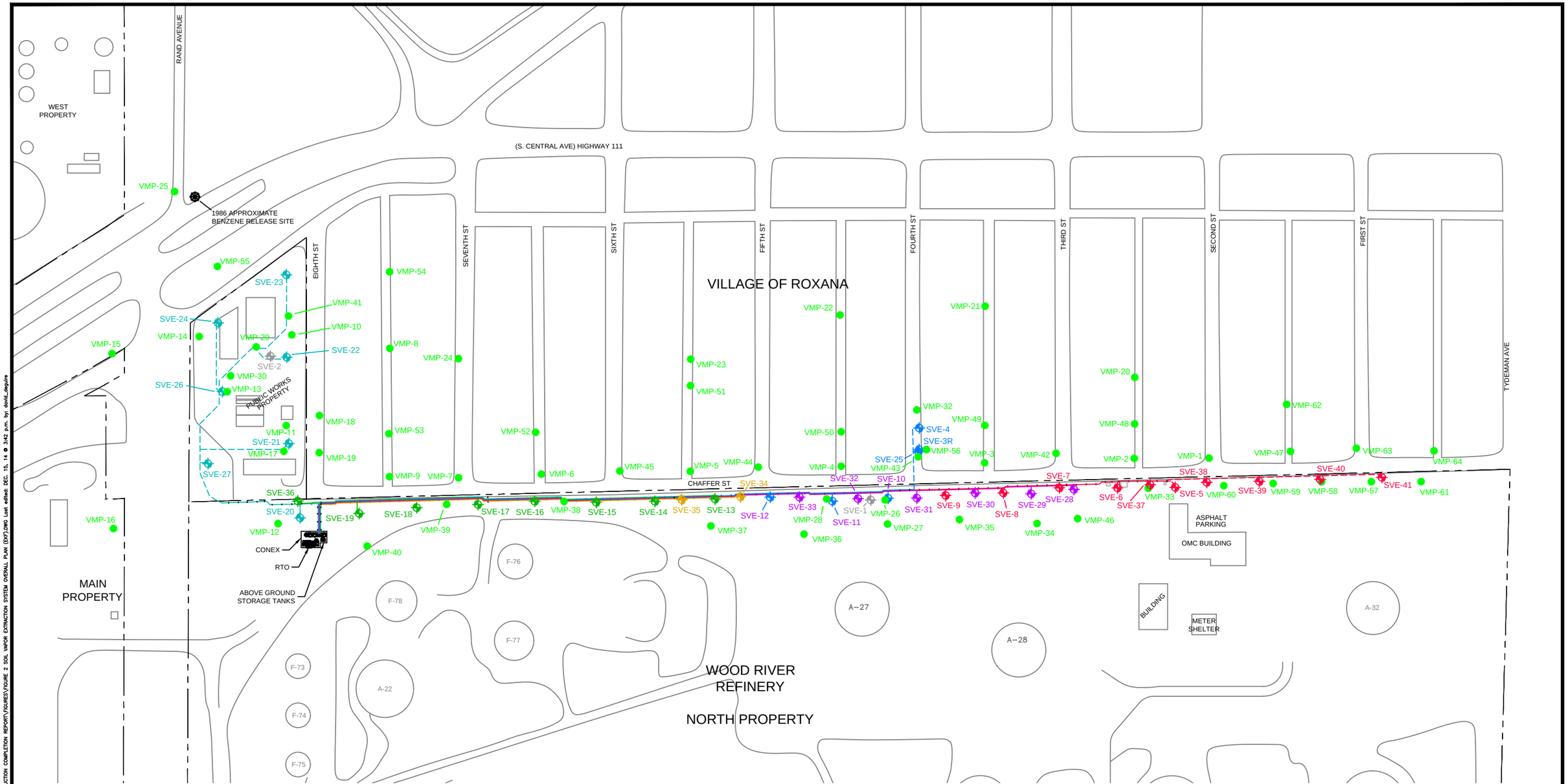
PROJECT NO.
21563720

URS

DRN. BY: djd November 2014
DSGN. BY: djd
CHKD. BY: ekf

Site Location Map

FIG. NO.
1



LEG NO.	SVE WELLS	COLOR	WELL SYMBOL
1	SVE-5 THROUGH SVE-9 SVE-37 THROUGH SVE-41	RED	
2	SVE-3R, SVE-4, SVE-25 & SVE-10 THROUGH SVE-12 SVE-42 THROUGH SVE-47	BLUE	
3	SVE-13 THROUGH SVE-19 & SVE-36	GREEN	
4	SVE-20 THROUGH SVE-24, SVE-26 & SVE-27	TEAL	
5	SVE-28 THROUGH SVE-33	PURPLE	
6	SVE-34 THROUGH SVE-35	BROWN	

LEGEND:

- SVE EXTRACTION WELL (SEE TABLE FOR COLOR LEGEND)
- VAPOR MONITORING POINT (VMP)
- PROPERTY BOUNDARY
- UNDERGROUND PIPING

Ø 200

SCALE FEET

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO. 21563720

URS

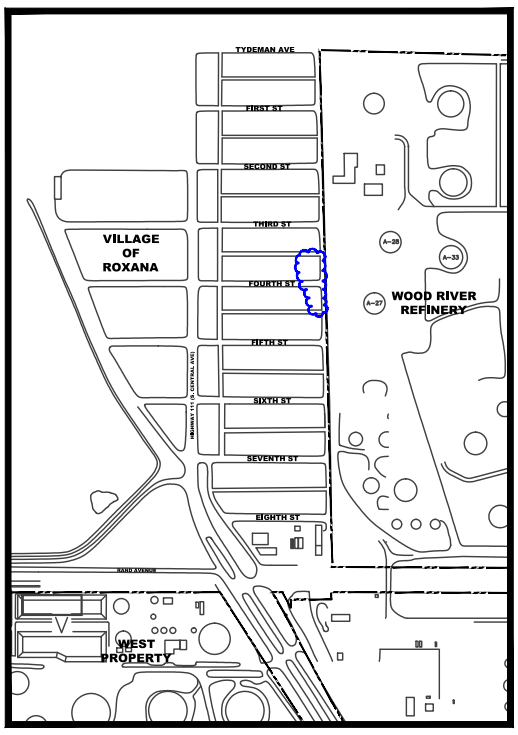
DRN. BY: djd November 2014
DSGN. BY: lv
CHKD. BY: ekf

Previously Constructed SVE System

FIG. NO. 2

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE 2 SOIL VAPOR EXTRACTION SYSTEM OVERALL PLAN (DXF).DWG Last edited: DEC. 15, 14 @ 3:42 p.m. by: david_deguire

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE 3 4TH STREET SVE SYSTEM EXTENSION CONSTRUCTION AREA.DWG Last edited: DEC. 15, 14 @ 3:36 p.m. by: david_deguire



KEYMAP
NOT TO SCALE

4TH STREET SVE SYSTEM EXTENSION CONSTRUCTION AREA

THIRD ST
FOURTH ST
FIFTH ST
CHAFFER ST
VILLAGE OF ROXANA
146 EAST 4TH
150 EAST 4TH
147 EAST 4TH
EXISTING GARAGE
CONCRETE WALK
SEWER
WATER
NATURAL GAS

SVE-28
SVE-7
SVE-29
SVE-8
SVE-30
SVE-9
SVE-31
SVE-10
SVE-1
SVE-32
SVE-11
SVE-33
SVE-12

VMP-46
VMP-42
VMP-49
VMP-3
VMP-35
VMP-31
VMP-56
VMP-32
VMP-43
VMP-26
VMP-50
VMP-22
VMP-4
VMP-28
VMP-36

ROST-5
ROST-32
ROST-31
ROST-33
ROST-34
ROST-35
ROST-36
ROST-37
ROST-8
ROST-38
ROST-39
ROST-40
ROST-41
ROST-42
ROST-9

SVE-4
SVE-3R
SVE-25

LEGEND

- EXISTING SHALLOW SVE WELL
- EXISTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- APPROXIMATE BOUNDARY OF FORMER RESIDENTIAL PROPERTY CURRENTLY OWNED BY SOPUS
- WRB REFINING LP PROPERTY BOUNDARY
- EXISTING RED LINE
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)
- EXISTING GREEN LINE
- EXISTING TEAL LINE
- EXISTING PURPLE LINE
- EXISTING BROWN LINE

Ø 5Ø
SCALE FEET
N

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PROJECT NO. 21563720

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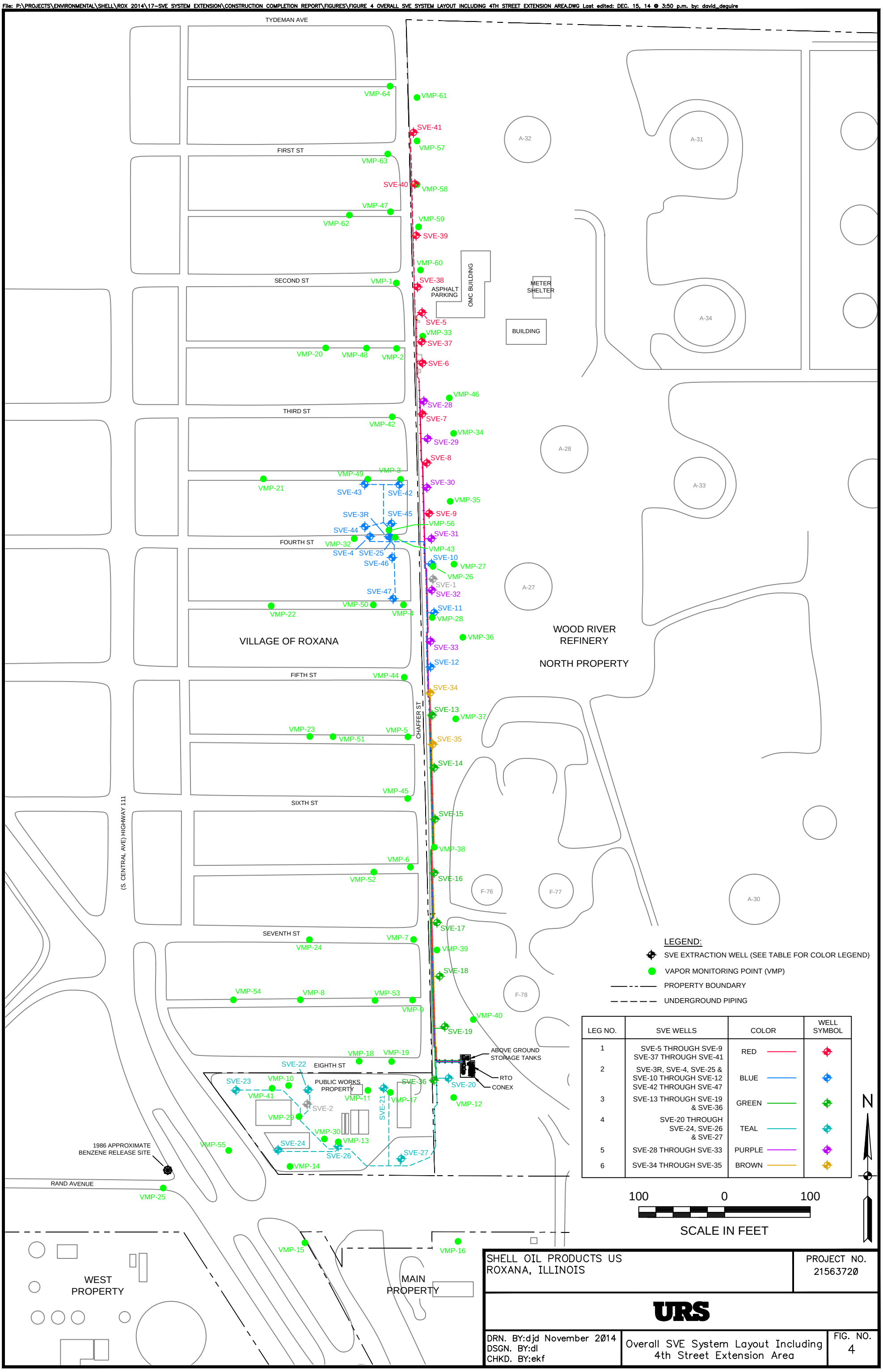
DSGN. BY: ekf
CHKD. BY: ekf

4th Street SVE System Extension Construction Area

FIG. NO. 3

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE 4 OVERALL SVE SYSTEM LAYOUT INCLUDING 4TH STREET EXTENSION AREA.DWG Last edited: DEC. 15, 14 @ 3:50 p.m. by: david_dequire



SHELL OIL PRODUCTS US
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PROJECT NO. 21563720

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DSGN. BY:dl
CHKD. BY:ekf

Overall SVE System Layout Including 4th Street Extension Area

FIG. NO. 4

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE 5 4TH STREET SVE SYSTEM EXTENSION AREA (EKF).DWG Last edited: DEC. 15, 14 @ 4:08 p.m. by: david_deguire

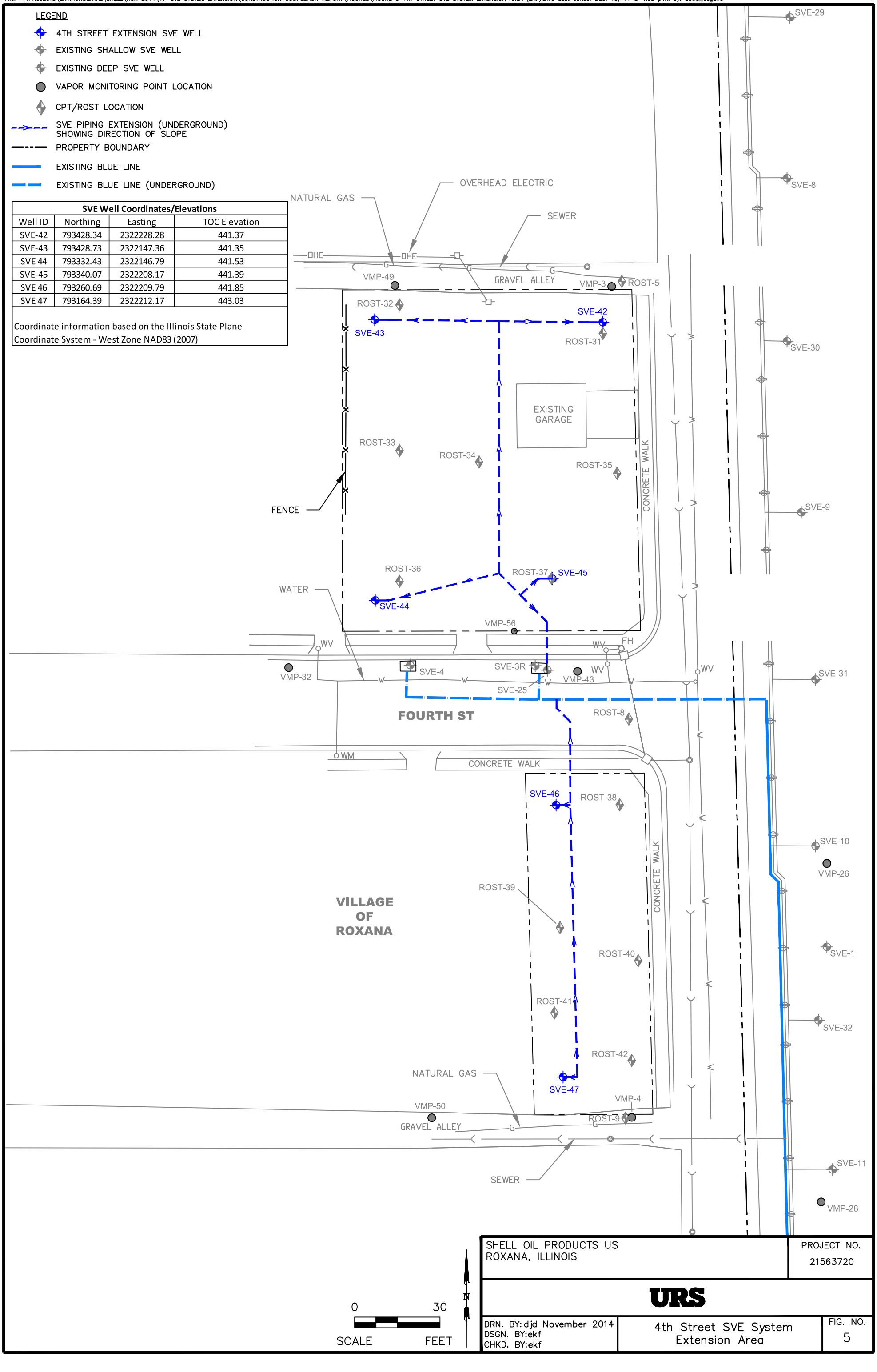
LEGEND

- 4TH STREET EXTENSION SVE WELL
- EXISTING SHALLOW SVE WELL
- EXISTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- SVE PIPING EXTENSION (UNDERGROUND) SHOWING DIRECTION OF SLOPE
- PROPERTY BOUNDARY
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)

SVE Well Coordinates/Elevations

Well ID	Northing	Easting	TOC Elevation
SVE-42	793428.34	2322228.28	441.37
SVE-43	793428.73	2322147.36	441.35
SVE 44	793332.43	2322146.79	441.53
SVE-45	793340.07	2322208.17	441.39
SVE 46	793260.69	2322209.79	441.85
SVE 47	793164.39	2322212.17	443.03

Coordinate information based on the Illinois State Plane Coordinate System - West Zone NAD83 (2007)



SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21563720
URS	
DRN. BY: djd November 2014 DSGN. BY:ekf CHKD. BY:ekf	4th Street SVE System Extension Area
	FIG. NO. 5

AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110-1337
www.aecom.com

314 429 0100 tel
314 429 0462 fax

Memorandum

To	SOPUS Roxana Project File	Page	1
CC			
Subject	Summary Report of Air Sparge Pilot Test		
From	John Carrow		
Date	February 22, 2015		

URS Corporation (URS), on behalf of Shell Oil Products US (SOPUS), is presenting this memo with the summary of findings of work conducted as part of the Air Sparging and Soil Vapor Extraction Pilot Test (AS/SVE Pilot Test) at 146, 147 and 150 East 4th St., Roxana, IL. The Air Sparging and Soil Vapor Extraction Pilot Test was conducted to evaluate the viability of adding air sparging (AS) to enhance the performance of the existing SVE system in the vicinity of East 4th Street and Chaffer Streets, shown on **Figure 1**.

The original AS/SVE Pilot Test scope of work included:

1. Cone Penetration Testing (CPT) and Laser Induced Fluorescence (i.e., Rapid Optical Screening Tool [ROST™]) borings;
2. Modification of SVE well SVE-3, installation of vapor monitoring point VMP-56, installation of additional monitoring points, and installation of an air sparging well;
3. A helium tracer test; and
4. A step and constant rate AS/SVE test.

Fine grained soil encountered at approximately 38 feet below ground surface (bgs) during installation of VMP-56 caused URS to accelerate the schedule and conduct a preliminary helium test before completion of AS and monitoring well installation as the presence of this fine grained layer could inhibit air sparge effectiveness.

This memorandum contains a summary of the observations and findings made during the CPT/ROST assessment conducted on the subject properties, the modification of SVE-3R, the installation of VMP-56, and results of helium tracer testing conducted at VMP-56 and SVE-3R, located on, and adjacent to the subject properties.

Summary of Observations

CPT/ROST Investigation

Cone Penetration Testing (CPT) and Laser Induced Fluorescence (i.e., Rapid Optical Screening Tool [ROST™]) borings were advanced to help characterize the geology of the pilot test area and to obtain additional information on the potential presence of residual hydrocarbons in the subsurface. Twelve CPT Borings (ROST-31 through ROST-42) were advanced beneath the three parcels during May 2013. The results of the CPT were consistent with observations made during previous investigations performed in the area. A thin layer of fine grained material was encountered at about 20 feet bgs in a few of the northern CPT locations (ROST-32, 34, 35, and 36). Additional fine grained layers were

encountered between 30 and 40 feet bgs in seven of the twelve CPT locations, including a fine grained layer approximately 37 feet bgs at ROST-37.

Ten of the twelve ROST™ locations had minor fluorescence, ranging from 3% to 13%. ROST-32 had 84% maximum fluorescence at 31 feet bgs. ROST-37 had 79% maximum fluorescence at 39 feet bgs, which was approximately two feet below the fine grained layer. Groundwater was encountered in this CPT location at approximately 42 feet bgs. The report for the CPT/ROST investigations, including CPT logs and additional information on this technology, was included in the Air Sparging and SVE Pilot Test Work Plan, submitted to IEPA in August, 2013.

SVE-3R and VMP-56

Existing SVE well SVE-3 had a screened interval from 5 to 15 feet bgs. This well was modified by over drilling the casing and screen with a hollow stem auger for complete removal of the well materials and filter pack. This method of modification did not allow for soil sampling to occur during drilling. The modified well, now referred to as SVE-3R, was constructed with a new screened interval from 31 to 41 feet bgs for the purpose of vapor removal from the lower vadose zone immediately above groundwater. This screen interval was chosen to place the screen above and below the fine grained soil observed at approximately 37 feet in ROST-37 and above the water level observed in nearby groundwater monitoring well MW-17. The construction completion report for SVE-3R is presented in **Attachment 1**.

A new monitoring location, VMP-56, was installed 15 feet northwest of SVE-3R/SVE-25 to monitor the vacuum at various depths throughout the pilot test. Three, 6-inch long stainless steel well screens (ports) were installed at depths of 10, 25, and 38.5 feet. The boring log for VMP-56 indicated a layer of silt and clay between 36 and 40 feet which corresponded with the fine-grained materials observed at ROST-37. The boring log for VMP-56 indicated that groundwater was present at 38.5 feet bgs. This observation was based on wet soils recovered beneath the silt and clay and not on measured groundwater levels. The boring log and construction completion report for VMP-56 is presented in **Attachment 2**. Analysis for grain size distribution in a sample from 37-38 feet bgs was performed by Terra Sense, Inc. The result was a dual soil classification of CL-ML confirming the presence of a clay-silt layer in VMP-56. The soil sample had a moisture content of 31%. Results from this test are presented in **Attachment 3**. Approximate elevations of screen intervals, the silt and clay layer, and groundwater for VMP-56-38.5 and SVE-3R are summarized on the table below.

	VMP-56-38.5 Approximate Elevation (msl)	**SVE-3R Approximate Elevation (msl)**
Ground Surface	442.37	441.71
Clay and Silt	406 – 402	406-402 (estimated)
Screen	404.37- 403.87	410.71- 400.71
Groundwater (MW-17, 2013 -2014)	402.15-399.20	402.15-399.20

Accutest Laboratories performed the analysis for three discrete soil samples collected during the boring of VMP-56. The results for BTEX are presented in the table below, indicating non-detections at the 10 and 25 foot bgs depths and detections at the 38.5 foot bgs depth.

Depth	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes (total)
		Result (mg/kg)	Result (mg/kg)	Result (mg/kg)	Result (mg/kg)
9 - 11 ft.	8/28/2013	< 0.00078	< 0.0078	< 0.0031	< 0.0031
24 - 25 ft.	8/28/2013	< 0.00071	< 0.0071	< 0.0028	< 0.0028
38 - 38.5 ft.	8/28/2013	104	1980	876	3160

VMP -SVE Helium Tracer Test

The existing SVE system has been very effective at removing soil vapors and providing pneumatic control in the vadose zone beneath the Site, including the 4th and Chaffer Street area. However, injection of air during air-sparging can change the pneumatic conditions (pressure distribution) in the subsurface which can affect the transport and capture of the soil gas and sparged air. The design for the AS/SVE Pilot Test called for sparge flow rates of 10, 20, and 40 SCFM. Due to the proximity of the planned air-sparge area to residences, a helium tracer test was conducted to assess the efficacy of the SVE system in capturing the injected helium before proceeding with an AS/SVE pilot test.

The CPT and ROST investigation in the area and the soil encountered in VMP-56, revealed the presence of a silt and clay layer at 36 to 37 feet bgs, which appears to be relatively consistent across the planned test area. Based on the groundwater elevation in MW-17 in 2013 and 2014, only 1 – 3 feet of unsaturated sandy soil between the groundwater surface and the base of this clay layer is available for the SVE system to capture the sparged air. The clay layer presents additional challenges that are discussed in more detail later. A conceptual drawing and cross section of the helium tracer test is included as **Attachment 4**. VMP-56-38.5 and SVE-3R were used as injection and extraction locations, respectively, for the tracer test.

SVE-3R is connected to the Blue Line of the SOPUS Roxana SVE system. At the time of the pilot test, the line had four wells operating on the line, SVE 12, 11, 10, and 3R (in order of distance from the SVE header). Flow measurement for the blue line is recorded at the header and was approximately 97 scfm on the day of the test. Making the assumption that flow is evenly distributed across the total well screen for the 4 wells operating on the blue line on the day of the test, flow at SVE-3R is estimated to have been 25% or 24.25 scfm.

The test was performed on December 27, 2013 to evaluate the recovery at SVE-3R of helium injected into VMP-56-38.5 located approximately 15 feet away. Helium concentration at the SVE-3R sample port was measured using an MGD-2002 helium detector. This portable instrument uses a thermal conductivity detector to detect helium.

Helium was injected in VMP-56-38.5 by connecting a cylinder of helium directly to the stainless steel tubing of the sample port. Helium was injected at a rate of 8L/min for 46 minutes using an adjustable fixed-flow regulator attached to the helium tank. Recovery of the injected helium was continuously monitored at the “downstream” sample port at SVE-3R. A helium detector was connected to a peristaltic pump (to overcome the back pressure of the vacuum) operating at 1L/min through a stainless steel dip-tube inserted into the “downstream” sample port on SVE-3R. The dip-tube was inserted into the center of the SVE-3R lateral piping to overcome turbulence along the pipe wall. Four Tedlar bags were also obtained during the test, which were later screened for helium to compare with instantaneous helium readings.

The concentration of helium was monitored and recorded for approximately two hours. A time weighted average of helium concentrations was calculated from the recovery data. A recovered mass was calculated using the following equation:

Mass (scf) = Time Weighted Avg. Conc. (ppmv/1,000,000) x [SVE Flow (scfm) x Recovery T (min)]

Summary of Findings and Conclusions

During the December 27, 2013 helium injection test at VMP-56, the total volume of helium injected into VMP-56-38.5 was 12.99 scf. Helium was first detected in SVE-3R 26 minutes after the initial injection into VMP-56-38.5. Helium injection was turned off after 46 minutes. Once detected, helium concentrations continued to rise at a linear rate throughout the injection period and immediately afterwards, until peaking at 5,800 ppm 63 minutes after the initial injection. After hitting the peak concentration, the helium levels declined at a roughly linear rate for 45 minutes before becoming undetectable in the system. Four confirmation Tedlar bag samples were collected over the course of the test and each contained concentrations of helium comparable to the corresponding direct readings. Helium concentrations at SVE-3R were recorded almost every minute until non-detectable readings were observed. The collection of tedlar bags was also recorded. The data from this test are provided in **Table 1** and **Chart 1**.

The time weighted average of the helium concentrations of recovered off gas at SVE-3R was 3,269 ppmv. An average of the four tedlar bag samples collected during the test was 2,950 ppmv. The estimated flow at SVE-3R was estimated at 24.25 scfm. Using this estimated flow and the time weighted averages and tedlar bag results, the percent recoveries from the helium tracer test ranged from 45 to 50 %. These results indicate only partial recovery of helium injected at 38.5 feet bgs at a distance of 15 feet away from of SVE-3R despite the fact that the injection point is well within the radius of influence of the SVE well.

Air Sparge and SVE design guidance documents[1] suggest that helium recoveries above 80% indicate the majority of the sparged air in a fully implemented system should be recovered. Recoveries of less than 30% are generally considered to indicate that air sparge is not a practical option. Between these two values, the viability of air sparge is uncertain and partly dependent on site specific conditions. URS does not recommend the development of an air sparge system at 4th and Chaffer due to the following:

- Recovery of sparged air will be constrained by the clay-silt layer at 36-40 feet bgs which limits the area of open screen to recover sparged air above the water table to 1-3 feet (see Attachment 4).
- Groundwater levels over the past two years have at times completely saturated the sandy soil layer beneath the clay-silt layer in the vicinity of the test.
- During a full scale test or the operation of an air sparge system, 2-3 feet of groundwater mounding would be expected in the vicinity of the sparge wells. This would further restrict the area of open screen for recovery of sparged air.
- If a system were fully implemented, unrecovered or fugitive sparged air containing VOC's could migrate laterally into the vadose zone in an uncontrolled manner that could negatively impact soil vapor concentrations elsewhere in the area.

Therefore, as the geology and hydrogeology conditions at the site appear to impede the ability of the system to recover sparged air and localized groundwater mounding from air sparging will further impede recovery, URS recommended that further testing of AS/SVE at this location is cancelled. It should be noted that while the conditions do not support the use of air sparge, the current SVE systems remains a viable technology for recovery of soil vapor at various depths through the soil profile.

[1] Leeson, et.al. August 12, 2002, "Air Sparging Design Paradigm", prepared by Battelle

Enclosures:

Table A1	VMP-56/SVE-3R Helium Tracer Test Recovery Data
Figure A1	Pilot Test Site Layout Map
Chart A1	VMP-56-38.5 Helium Recovery Test Graph
Attachment 1	SVE-3R Well Construction Diagram
Attachment 2	VMP-56 Boring Log and Well Construction Diagram
Attachment 3	VMP-56 Particulate Size Distribution
Attachment 4	Helium Tracer Test Cross Section and Conceptual Diagram

Table A-1
VMP-56/SVE-3R Helium Tracer Test Recovery Data

Well ID	Date	Time	[Helium] (ppm)	Time between readings	Average He Concentration Between Readings (ppm)	Time*Average He Concentration Between Readings	Comments
SVE-3R	12/27/2013	10:37	0.0				Begin injecting He into VMP-56-38.5 at 8L/min.
SVE-3R	12/27/2013	11:03	25	0:26	0	0	Helium begins to linearly rise on instrument.
SVE-3R	12/27/2013	11:07	1100	0:04	563	2	Tedlar sample: 1275 ppm.
SVE-3R	12/27/2013	11:13	3000	0:06	2050	9	
SVE-3R	12/27/2013	11:17	4300	0:04	3650	10	Tedlar sample: 4225 ppm.
SVE-3R	12/27/2013	11:20	5000	0:03	4650	10	Tedlar sample: 4500 ppm.
SVE-3R	12/27/2013	11:24	5100	0:04	5050	14	Helium tank turned off at 1123. Begin taking instantaneous readings approx. every 1 min.
SVE-3R	12/27/2013	11:25	5200	0:01	5150	4	
SVE-3R	12/27/2013	11:26	5400	0:01	5300	4	
SVE-3R	12/27/2013	11:27	5500	0:01	5450	4	
SVE-3R	12/27/2013	11:28	5600	0:01	5550	4	
SVE-3R	12/27/2013	11:29	5700	0:01	5650	4	
SVE-3R	12/27/2013	11:30	5600	0:01	5650	4	
SVE-3R	12/27/2013	11:31	5600	0:01	5600	4	
SVE-3R	12/27/2013	11:33	5700	0:02	5650	8	
SVE-3R	12/27/2013	11:34	5700	0:01	5700	4	
SVE-3R	12/27/2013	11:35	5700	0:01	5700	4	
SVE-3R	12/27/2013	11:37	5700	0:02	5700	8	
SVE-3R	12/27/2013	11:38	5700	0:01	5700	4	
SVE-3R	12/27/2013	11:40	5800	0:02	5750	8	
SVE-3R	12/27/2013	11:41	5600	0:01	5700	4	
SVE-3R	12/27/2013	11:42	5500	0:01	5550	4	
SVE-3R	12/27/2013	11:43	5400	0:01	5450	4	
SVE-3R	12/27/2013	11:44	5300	0:01	5350	4	
SVE-3R	12/27/2013	11:45	5300	0:01	5300	4	
SVE-3R	12/27/2013	11:47	5200	0:02	5250	7	
SVE-3R	12/27/2013	11:48	5100	0:01	5150	4	
SVE-3R	12/27/2013	11:49	5000	0:01	5050	4	
SVE-3R	12/27/2013	11:50	4900	0:01	4950	3	
SVE-3R	12/27/2013	11:51	4700	0:01	4800	3	
SVE-3R	12/27/2013	11:52	4600	0:01	4650	3	
SVE-3R	12/27/2013	11:53	4200	0:01	4400	3	
SVE-3R	12/27/2013	11:54	4000	0:01	4100	3	
SVE-3R	12/27/2013	11:55	3800	0:01	3900	3	
SVE-3R	12/27/2013	11:56	3500	0:01	3650	3	
SVE-3R	12/27/2013	11:57	3300	0:01	3400	2	
SVE-3R	12/27/2013	11:58	3000	0:01	3150	2	
SVE-3R	12/27/2013	11:59	2800	0:01	2900	2	
SVE-3R	12/27/2013	12:00	2500	0:01	2650	2	
SVE-3R	12/27/2013	12:04	2200	0:04	2350	7	Tedlar sample (from 1201): 1750 ppm.
SVE-3R	12/27/2013	12:05	1900	0:01	2050	1	
SVE-3R	12/27/2013	12:06	1600	0:01	1750	1	
SVE-3R	12/27/2013	12:07	1400	0:01	1500	1	
SVE-3R	12/27/2013	12:08	1300	0:01	1350	1	
SVE-3R	12/27/2013	12:09	1100	0:01	1200	1	
SVE-3R	12/27/2013	12:10	1000	0:01	1050	1	
SVE-3R	12/27/2013	12:11	900	0:01	950	1	
SVE-3R	12/27/2013	12:12	800	0:01	850	1	
SVE-3R	12/27/2013	12:13	700	0:01	750	1	
SVE-3R	12/27/2013	12:14	600	0:01	650	0	
SVE-3R	12/27/2013	12:15	500	0:01	550	0	
SVE-3R	12/27/2013	12:16	400	0:01	450	0	
SVE-3R	12/27/2013	12:17	400	0:01	400	0	
SVE-3R	12/27/2013	12:18	300	0:01	350	0	
SVE-3R	12/27/2013	12:19	300	0:01	300	0	
SVE-3R	12/27/2013	12:20	200	0:01	250	0	
SVE-3R	12/27/2013	12:21	200	0:01	200	0	
SVE-3R	12/27/2013	12:22	200	0:01	200	0	
SVE-3R	12/27/2013	12:23	100	0:01	150	0	
SVE-3R	12/27/2013	12:24	100	0:01	100	0	
SVE-3R	12/27/2013	12:25	0	0:01	50	0	

Time of He Recovery:	**82 min**	**82 min**
Time Weighted Average Concentration of Test		
= (∑ time between readings * average concentration during interval)/ total test time	**Average of four Tedlar bag samples**	
	3,269 ppm	**2,950 ppm**
Percent Recovery Inputs		
SVE flow rate	**24.25 scfm**	**24.25 scfm**
Injection flow rate	**0.28 scfm**	**0.28 scfm**
Injection time	**46.00 minutes**	**46.00 minutes**
Volume He inject	**12.99 scf**	**12.99 scf**
Total Volume dur	**6.50 scf**	**5.87 scf**
% Recovery	**50.04%**	**45.16%**

File: P:\PROJECTS\ENVIRONMENTAL\SHELL OIL PRODUCTS US 2014\3-ROXANA\16-AIR SPARGE ASSESSMENT\DRAFT REPORT\FIGURES\FIGURE 1 PILOT TEST SITE LAYOUT MAP.DWG Last edited: SEP. 10, 14 @ 09:51 a.m. by: david_deguire

LEGEND

- AIR SPARGE WELL
- OBSERVATION MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- APPROXIMATE RESIDENTIAL PROPERTY BOUNDARY
- WRB REFINING LP PROPERTY BOUNDARY

NOTES:
1. GRAYSCALE LOCATIONS REPRESENT PREVIOUS SAMPLE LOCATIONS OR EXISTING INVESTIGATION POINTS.
2. AIR SPARGE AND OBSERVATION WELL LOCATIONS NOT COMPLETED. VMP-56 AND SVE-3R WERE ONLY WELLS INSTALLED FOR THIS PILOT TEST.

THIRD ST

ROST-4-PZ(C)
ROST-4-PZ(D)
ROST-4-PZ
ROST-4
GWP-4
VMP-42
ROST-4-PZ(E)
ROST-4-PZ(F)
SVE-28
P-60-11
SVE-7
SVE-29
GP-15
P-60-S
P-60-12
P-60
P-60-12S
ROST-29
P-60-13
P-60-13S
SVE-8

GWP-13
ROST-20
ROST-4-PZ(G)
VMP-49
ROST-32
ROST-5-PZ
ROST-5
GWP-5
VMP-3
ROST-31
SVE-30
EXISTING GARAGE
ROST-33
ROST-34
ROST-35
VILLAGE OF ROXANA
146
150
VMP-31
ROST-36
ROST-37
MW-17
OW-1
VMP-56
AS-1
OW-2
VMP-32
SVE-4
SVE-3R
SVE-25
VMP-43
SVE-9
T-12
SVE-31
ROST-16
FORMER HOUSE FOOTPRINT
FOURTH ST
ROST-7
MW-22
ROST-7-PZ
ROST-8
GWP-6
OW-3
ROST-38
147
SVE-10
VMP-26
ROST-39
ROST-40
SVE-1
ROST-41
ROST-42
SVE-32
MW-18
GWP-14
VMP-50
ROST-9
GWP-7
VMP-4
ROST-17
SVE-11
VMP-28
SVE-33
ROST-26

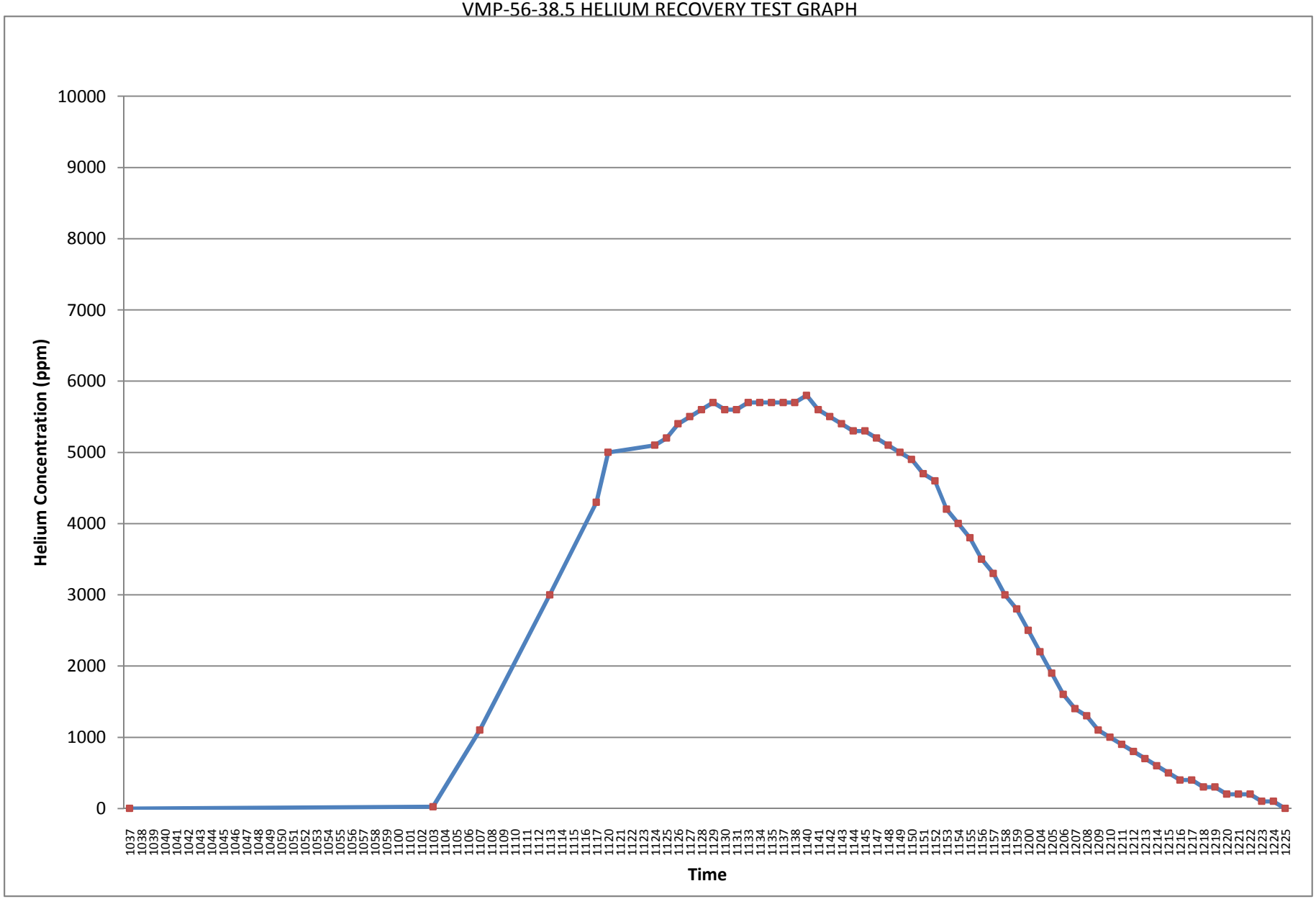
SCALE Ø 4Ø FEET

N

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21562973
URS	
DRN. BY:djd September 2014 DSGN. BY:mcc CHKD. BY:mcc	Pilot Test Site Layout Map FIG. NO. A1

CHART A1

VMP-56-38.5 HELIUM RECOVERY TEST GRAPH



ATTACHMENT ONE

SVE-3R Well Construction Diagram

FLUSH MOUNT MONITORING WELL CONSTRUCTION DIAGRAM

GROUND SURFACE ELEVATION **441.71**

TOP OF INNER WELL CASING ELEVATION **440.75**

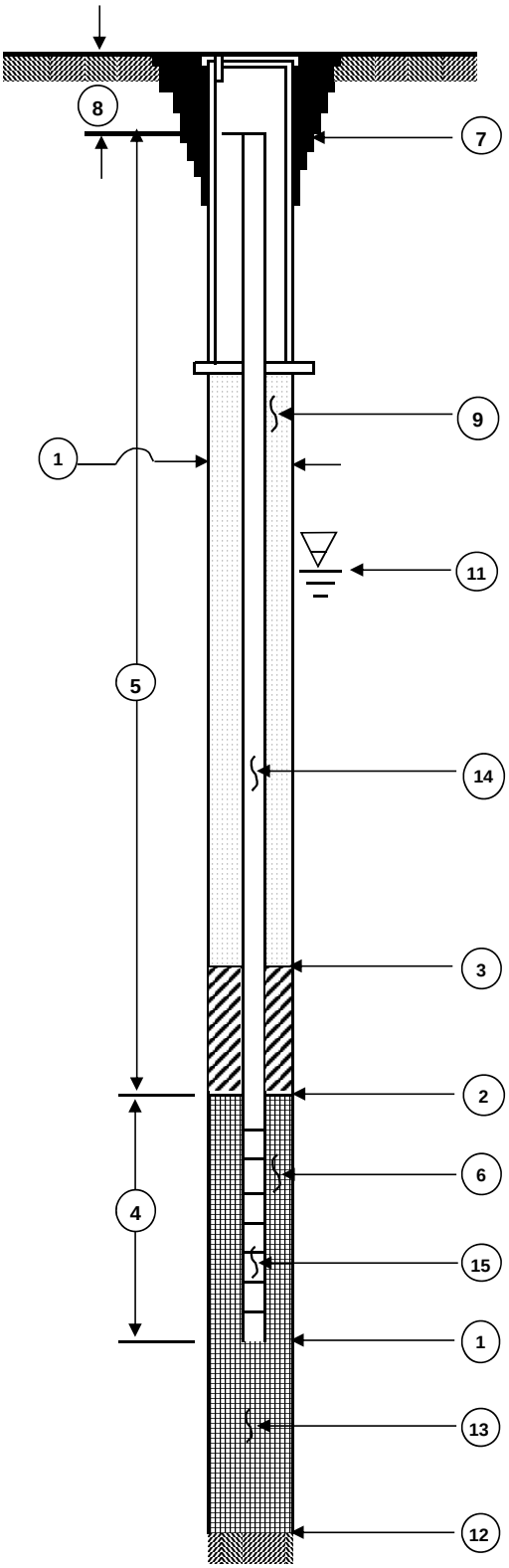
DATUM **1988 USGS**

JOB NUMBER **21562850**

BORING NUMBER **SVE-3R**

INSTALLATION DATE **29-Aug-13**

LOCATION **Roxana, IL**



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE **41.15** FEET.*

(2) DEPTH TO TOP OF FILTER PACK 29.00 FEET.*

(3) DEPTH TO TOP OF SEAL 4.54 FEET.* TIME 1815

(4) LENGTH OF WELL SCREEN **10** FEET.
SLOT SIZE **0.01** INCHES.

(5) TOTAL LENGTH OF RISER PIPE **29.63** FEET AT **4** INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE **ANSI/NSF Quartz Sand** .

(7) CONCRETE CAP? [YES] NO (CIRCLE ONE)

(8) DEPTH TO TOP OF INNER CASING BELOW GROUND SURFACE **1.54** FEET.

(9) TYPE OF UPPER BACKFILL **Bentonite Pellets** .

(1) BOREHOLD DIAMETER **8** INCHES.

(11) DEPTH TO GROUNDWATER **36.9** FEET BELOW TOP OF INNER CASING **NA** HOURS AFTER WELL DEVELOPMENT.

(12) TOTAL DEPTH OF BOREHOLE **41.17** FEET.*

(13) TYPE OF LOWER BACKFILL **ANSI/NSF Quartz Sand** .

(14) PIPE MATERIAL **Schedule 40 PVC** .

(15) SCREEN MATERIAL **Schedule 40 PVC** .

* (DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

URS Corporation

ATTACHMENT TWO

VMP-56 Boring Log and Well Construction Diagram

LOG OF BORING AND WELL CONSTRUCTION DETAIL

8/23/13 6

Start Date: 8/23/13
Completion Date: 8/23/13
Casing Elevation: Not Installed
Ground Elevation: 442.37

Coordinates 793321.41
Northing: 2322195.04
Easting: 2322195.04

Depth In feet	Well Construction	Inches Driven	Inches Recovered	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
							FILL	Grass and roots	
		36	32	2.2 11.25			CL	Medium stiff, moist, brown, silty CLAY (CL), low plaasticity	
5		60	45	1.1 10 1.0 11.05			CL SM	Medium stiff, moist, brown, sandy CLAY (CL), low plasticity Moist, brown, medium dense, silty SAND (SM)	
10		60	52	1.0 10.56 1.5 10.28			SP	Loose, moist, brown, fine SAND (SP) Becomes light brown, dry	Sample 9-11' @ 1350 w/MSMSD
15		60	44	1.8 10.49 2.1 10.66				Becomes moist, some sand with silt Some reddish staining	
20		60	55	1.9 10.62 2.0 10.08					
				2.9					Sample 24-25' @ 1440

Completion Depth: 41.0 ft bgs
Project No.: 21562850.06000
Project Name: Air Sparge Pilot Test
Drilling Contractor: Roberts Environmental Co.
Drilling method: Direct Push Rig Type: Geoprobe 8040 DT
Drilled by: Shawn Seymour
Logged by: M. Corbett

Water Depth: 38.5 ft., After ATD hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
◧ Splitspoon Sampler
◨ Hollow Stem Auger-
Soil samples not collected

Geoprobe
Air Knife/Hand Auger Sampler
Air Rotary
Sonic

USC based on field visual observations

URS

URS (ENVIRON) LOG + 3 WELLS P:\RESOURCES\GINTDATA\GINT\PROJECTS\21562850.06000 (VMP-56 AIR SPARGE 2013).GPJ P:\RESOURCES\GINTDATA\GINT\ENVIRONMENTAL\URSSTLEV.GLB 9/23/14

LOG OF BORING AND WELL CONSTRUCTION DETAIL

8/23/13 6

Start Date: 8/23/13
Completion Date: 8/23/13
Casing Elevation: Not Installed
Ground Elevation: 442.37

Coordinates 793321.41
Northing: 2322195.04
Easting: 2322195.04

Depth In feet	Well Construction	Inches Driven	Inches Recovered	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		60	56	10.76				Loose, moist, brown, fine SAND (SP)	
				2.5					
				10.54			SP	Dense, moist, gray, fine SAND (SP)	
		60	52	1.7				Medium dense, moist, gray, fine SAND (SP)	
30				10.48					Sample 30.5-33' @ 1410
				0.2					
				9.58			SP		
		60	58	4.1					
35				10.83					
				529			CL	Medium stiff, moist, gray, silty CLAY (CL)	Some black staining at 36'
							SM	Dense, moist, gray, silty SAND (SM)	
				31.41			CL	Medium stiff, moist, gray, silty CLAY (CL), some sand	Sample Geotech 37-38'
		36	36	749			ML	Medium stiff, moist, gray, SILT (ML), some sand	Sample 38-38.5'@1455 with DP
40				31.41			ML	Medium stiff, wet, gray, SILT (ML) Some clay	
							SP	Medium dense, wet, gray, fine SAND (SP)	Lab Results 37-38': Water Content: 31.0% USCS Symbol: CL-ML Sieve Minus No. 200: 93.8% Hydrometer % Minus µm: 4%
								Bottom of boring at 41' bgs	
45									

Completion Depth: 41.0 ft bgs
Project No.: 21562850.06000
Project Name: Air Sparge Pilot Test
Drilling Contractor: Roberts Environmental Co.
Drilling method: Direct Push Rig Type: Geoprobe 8040 DT
Drilled by: Shawn Seymour
Logged by: M. Corbett

Water Depth: 38.5 ft., After ATD hrs.
Water Depth: ____ ft., After ____ hrs.

- Water level at time of drilling
- Water level after drilling
- ATD - At time of drilling
- Splitspoon Sampler
- Hollow Stem Auger- Soil samples not collected
- Geoprobe
- Air Knife/Hand Auger Sampler
- Air Rotary
- Sonic

USC based on field visual observations

URS

URS (ENVIRON) LOG + 3 WELLS P:\RESOURCES\GINTDATA\GINT\PROJECTS\21562850.06000 (VMP-56 AIR SPARGE 2013).GPJ P:\RESOURCES\GINTDATA\GINT\ENVIRONMENTAL\URSSTLEV.GLB 9/23/14

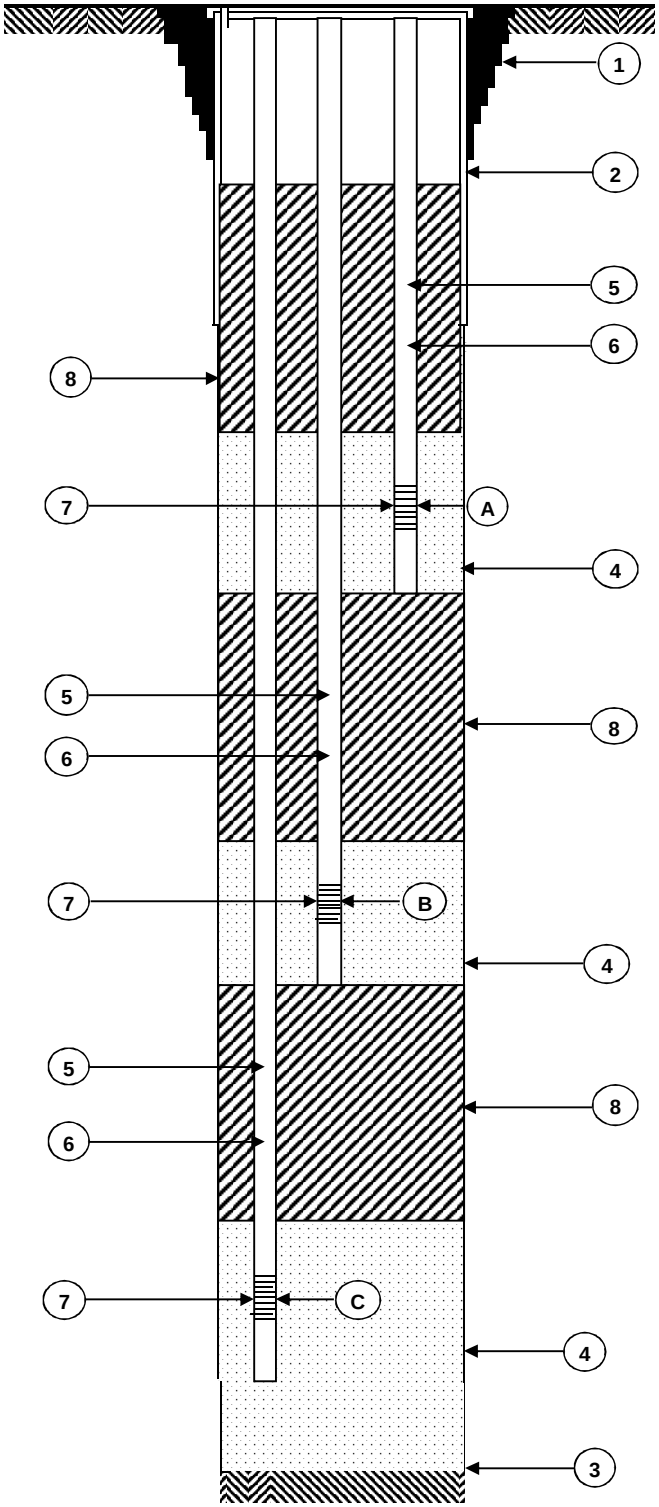
VAPOR MONITORING POINT CONSTRUCTION DIAGRAM

GROUND SURFACE ELEVATION (FEET) **442.37** JOB NUMBER **21562850**

TOP OF INNER WELL CASING ELEVATION **NA** BORING NUMBER **VMP-56**

DATUM **1988 USGS** INSTALLATION DATE **8/28/2013**

LOCATION **Roxana, Illinois - east end of 4th Street near Chaffer Ave.**



VAPOR MONITORING PORT INSTALLATION DETAILS

SCREEN	DEPTH TO BOTTOM OF SAND (FEET*)	DEPTH TO TOP OF SAND (FEET*)	DEPTH TO BOTTOM OF SCREEN (FEET*)	DEPTH TO TOP OF SCREEN (FEET*)	LENGTH OF SCREEN (FEET)	DIAMETER OF SCREEN (INCHES)	SLOT SIZE (INCHES)
A	10.5	9.0	10	9.5	0.5	0.5	0.010
B	25.5	24.0	25.0	24.5	0.5	0.5	0.010
C	41.0	37.5	38.5	38.0	0.5	0.5	0.010

1 CONCRETE CAP? [YES] NO (CIRCLE ONE)

2 BOREHOLE DIAMETER 4.25 INCHES

3 TOTAL DEPTH OF BOREHOLE 41 FEET*

4 TYPE OF PACK AROUND SCREEN ANSI/NSF Quartz Sand

5 RISER MATERIAL Stainless Steel

6 RISER DIAMETER 0.125 INCHES

7 SCREEN MATERIAL Stainless Steel

8 TYPE OF SEAL Bentonite Pellets

* (DEPTH FROM GROUND SURFACE)

NOTE: DRAWING NOT TO SCALE

URS Corporation

ATTACHMENT THREE

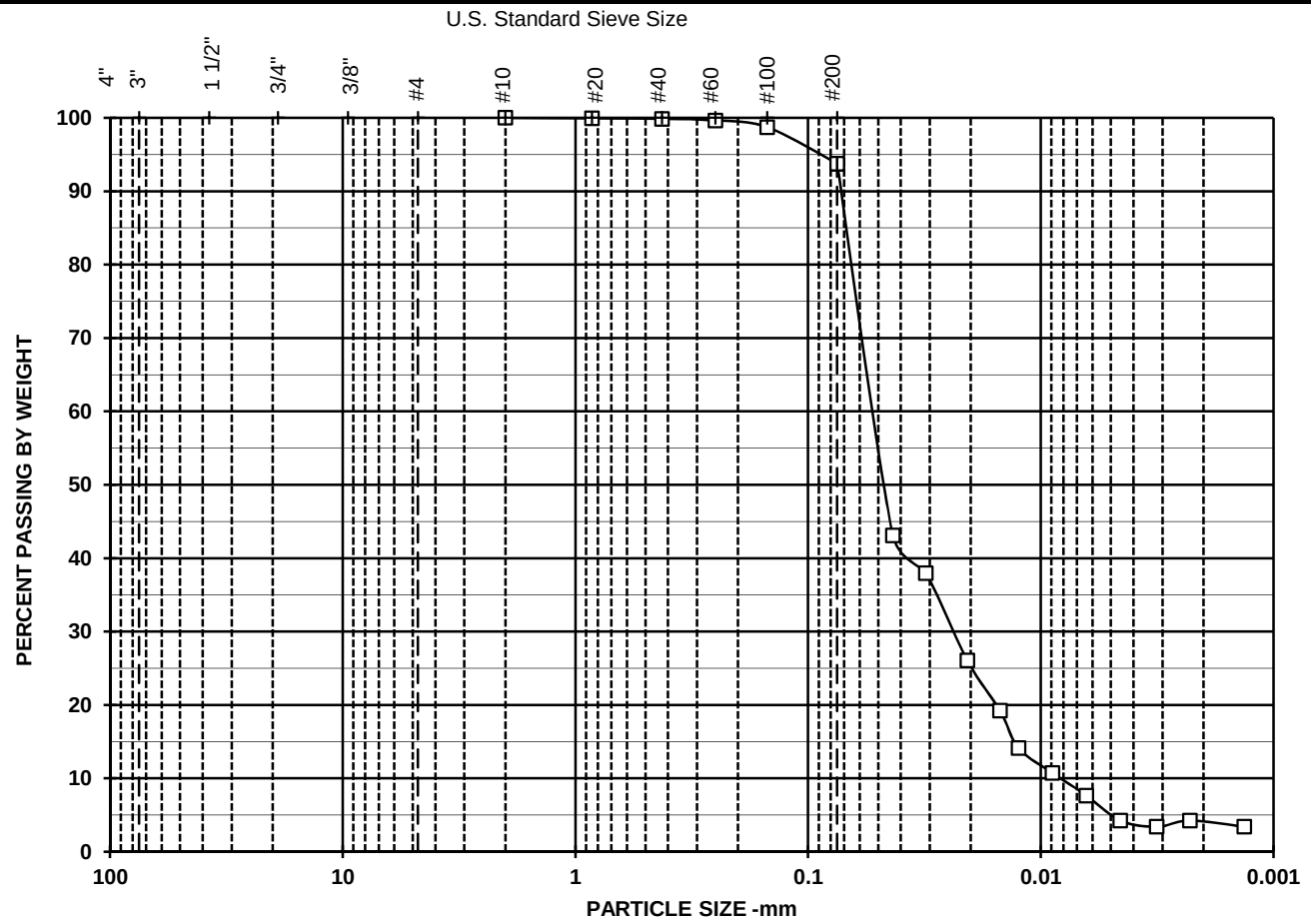
VMP-56 Particulate Size Distribution

URS #21562850
Roxana Site - Air Sparge / Soil Vapor Extraction Pilot
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS				REMARKS
			WATER CONTENT (%)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
VMP-56		37-38	31.0	CL-ML	93.8	4	

Note: (1) USCS symbol based on visual observation and Sieve reported.

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Symbol	□	■	○
Boring	VMP-56		
Sample			
Depth	37-38		
% +3"	0.0		
% Gravel	0.0		
% SAND	6.2		
%C SAND	0.0		
%M SAND	0.1		
%F SAND	6.1		
% FINES	93.8		
% -2μ	4		
D_{100} (mm)	2.00		
D_{60} (mm)	0.05		
D_{30} (mm)	0.02		
D_{10} (mm)			
Cc			
Cu			

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			
3/4"			
3/8"			
4			
10	100.0		
20	99.9		
40	99.9		
60	99.6		
100	98.7		
200	93.8		

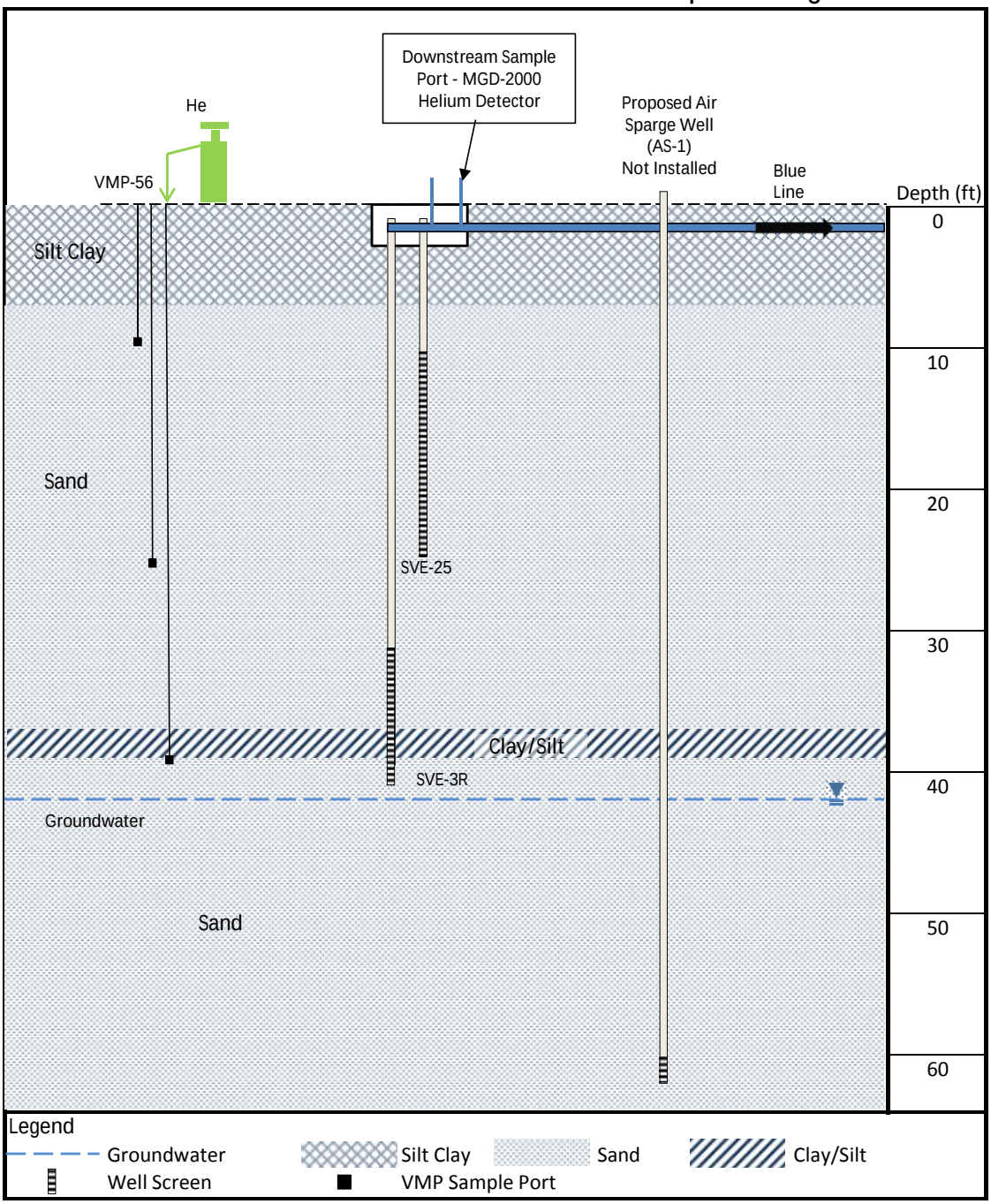
SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	31.0				CL-ML	Gray, Silty clay	9/10/2013
■							
○							

TerraSense, LLC	URS
T21562850	21562850

PARTICLE SIZE DISTRIBUTION

Roxana Site - Air Sparge / Soil Vapor Extraction Pilot

Helium Tracer Test Cross Section and Conceptual Diagram



Note: Not to scale - For conceptual use only

APPENDIX B

C O N C E P T U A L D E S I G N

CONCEPTUAL DESIGN
SVE SYSTEM EXTENSION

EAST 4TH AND CHAFFER STREETS

Roxana, Illinois

Prepared for
Shell Oil Products US
17 Junction Drive
PMB #399
Glen Carbon, Illinois 62034

July 2014

URS Corporation
1001 Highland Plaza Drive West, Suite 300
St. Louis, MO 63110
(314) 429-0100
Project #21562973.19000

TABLE OF CONTENTS

At the request of Shell Oil Products US (SOPUS), URS Corporation (URS) developed a conceptual design for an extension of the Soil Vapor Extraction (SVE) system (System) previously constructed along the west boundary (West Fenceline) of the Wood River Refinery (WRR) North Property, in the Village of Roxana, Illinois (Village) and within the Village Public Works (PW) Yard. The site location is shown in **Figure 1**, and the existing System layout is shown in **Figure 2**. The proposed extension of the System will be constructed on three vacant lots currently owned by SOPUS located at 146, 147, and 150 East 4th Street within the Village (**Figure 3**) and will be connected to existing underground SVE system piping located in East 4th Street. The purpose of the proposed additional SVE wells and extension of the existing SVE System on these parcels is to address soil impacts and reduce the potential for soil vapor intrusion into the Village.

With the exception of a garage located at 150 East 4th Street, the three parcels are currently vacant. The properties were purchased by SOPUS and the former homes were subsequently razed in November and December 2012. The former foundation walls and basement floors were also removed. Each excavation was backfilled with clean sand brought on-site from an external source. The ground surface was graded and sodded with perennial grass. Currently, each lot is covered in grass which is regularly mowed and maintained. The garage located at 150 East 4th Street is currently used for storage.

The initial portion of the SVE System within the WRR was constructed during the fall of 2011 and became operational in January 2012. An extension of the System into the PW Yard was completed and became operational during the fall of 2012. A northern extension of the system within the WRR was constructed and became operational during the late summer and fall of 2013. The current configuration of the System consists of 39 extraction wells (30 wells at the WRR site, 3 wells in the Village, and 6 wells at the PW site) plumbed through six independent lines or legs (**Figure 2**). The piping leads to the treatment equipment, which consists of a rotary lobe positive displacement blower, two vapor/liquid separators (VLSs) with associated aboveground liquid storage tanks (ASTs), and a regenerative thermal oxidizer (RTO). Additional information regarding the System is available in the *SVE System Construction Completion Report*, dated May 30, 2012, the *SVE System Construction Completion Report Addendum*, dated February 14, 2013, and the *SVE System Construction Completion Report Addendum No. 2 – SVE System Extension*, dated January 9, 2014.

3.1 SVE WELL LOCATION AND SCREEN INTERVAL RATIONALE

Six additional SVE wells (SVE-42 through SVE-47) are proposed to be installed within the boundaries of the former residential parcels owned by SOPUS at the approximate locations shown in **Figure 3**. The spacing of the proposed wells is based on a design radius of influence (ROI) of 60 feet for SVE-42, 43, 44, 46, and 47, which is consistent with the ROI used for design of the West Fenceline portion of the SVE System as documented in the June 2011 *Conceptual/Final Design Report*. The effective ROI of at least 60 feet has been confirmed through ongoing system operation and monitoring. The design ROI for SVE-45 is assumed to be 30 feet since this well will be screened within a smaller interval to target impacts within and below a silty sand layer. The proposed location of each SVE well was selected based on evaluation of Cone Penetration Testing (CPT) data and Rapid Optical Screening Tool (ROST™) Laser Induced Fluorescence data gathered from 12 CPT/ROST™ soil borings (ROST—31 through ROST-42) completed on the parcels in May 2013 and from three CPT/ROST™ borings (ROST-5, ROST-8, and ROST-9) completed within the public rights-of-way adjacent to the parcels in August 2009 (prior to System start-up). The CPT and ROST™ logs are provided in **Appendix A**. In addition, soil vapor screening data, soil vapor laboratory analytical data, and System vacuum data collected monthly from numerous VMPs located in the vicinity of the parcels were used to assist in determining the locations of the proposed SVE wells.

CPT and ROST™ data collected during the May 2013 investigation and 2009 CPT and ROST™ data were used to assist in determining the proposed SVE well locations. A plan view of the subject parcels was developed showing ROST™ responses greater than 2% fluorescence above the water table (**Figure 4**) and Geologic Cross Sections were developed showing the vertical distribution of ROST™ responses greater than 2% fluorescence and stratigraphy beneath the subject parcels (**Figure 5** and **Figure 6**).

The anticipated total depth and screened interval of each proposed SVE well was also determined based on ROST™ fluorescence (both the borings located on the subject parcels as well as borings located adjacent to the parcels), VMP screening results, and laboratory analytical data. The proposed SVE wells were projected onto the geologic cross-sections (**Figure 5** and **Figure 6**) to show screen interval placement relative to the extents of total fluorescence greater than 2% above the water table.

A summary of the rationale for selecting the anticipated location and screened interval of each proposed SVE well is presented in the following table.

Well No.	Screen Interval (ft bgs)	Location and Rationale
SVE-42	25-35	NE corner of Lot 150 - ROST™ response of 5% total fluorescence in ROST-31 at 27 feet bgs. Benzene soil vapor levels greater than screening criterion in VMP-3; ROST™ responses of 34% and 37% total fluorescence in ROST-5 (located north of subject parcels) at 23.5 and 33 feet bgs, respectively.
SVE-43	25-35	NW corner of Lot 146 - ROST™ response of 84% total fluorescence in ROST-32 at 31 feet bgs.
SVE-44	25-35	SW corner of Lot 146 - ROST™ response of 4% total fluorescence in ROST-36 at 37 feet bgs.
SVE-45	37-42	Central portion of Lot 150 – ROST™ response of 79% total fluorescence in ROST-37 at 39 feet bgs. Short screen intended to target impact within and below a silty sand to sandy silt layer.
SVE-46	15-25	NW corner of Lot 147 - ROST™ response of 6% total fluorescence in ROST-39 at 20 feet bgs. Indicates residual hydrocarbon impact within silty sands to sandy silts. ROST™ response of 11% total fluorescence in ROST-40 at 19 feet bgs.
SVE-47	15-25	SW corner of Lot 147 – ROST™ response of 6% total fluorescence in ROST-39 at 20 feet bgs. ROST™ response of 11% total fluorescence in ROST-40 at 19 feet bgs. Benzene soil vapor levels greater than screening criteria in VMP-50 at 30 feet bgs; ROST™ response of 19% total fluorescence in ROST-9 (located south of subject parcels) at 21 feet bgs.

The anticipated locations and screen intervals presented on the above table are based on review of available data and subject to modification based on field observations. The SVE wells located near the perimeter of the parcel boundaries will be placed as near to the property lines as possible to facilitate drilling and piping installation activities.

3.2 SVE WELL INSTALLATION PROCEDURES AND CONSTRUCTION

SVE well borings will be advanced utilizing hollow-stem auger (HSA) drilling technology. Soil from the borings will be continuously logged to document the lithology in accordance with applicable ASTM standards and the Unified Soil Classification System (USCS). Soil attributes such as color, particle size, consistency, moisture content, structure, plasticity, odor (if obvious), and organic content (if visible) will be noted. In addition, the soil will be screened in the field using a photoionization detector (PID). Observations will be recorded on soil boring logs. It is anticipated that one discrete soil sample will be collected for laboratory analysis from each boring from a depth having the highest PID reading within the screened interval of the proposed SVE well. If the highest PID reading in a boring is not within the screened interval, an additional sample will be collected from the depth exhibiting the highest PID reading.

Each SVE well will be constructed of 4-inch diameter, 0.010-inch slotted, Schedule 40 PVC well screen and Schedule 40 PVC riser. Screens will be 10-feet long with the exception of SVE-45 where a 5-foot screen will be used. A granular filter pack will extend to approximately 2-feet above the top of the screen. An approximate 3-foot thick bentonite seal will be installed immediately above the sand pack. The remaining annular space will be filled with cement bentonite grout to a depth of approximately 2-feet bgs.

The well will be completed in a flush mount vault of size and configuration to facilitate the connection of the well head to the SVE piping.

3.3 EXISTING EAST 4TH STREET SVE WELLS

Three existing SVE wells, SVE-3R, -4, and -25 are currently located in vaults in 4th Street and are connected to the system inside the refinery by underground piping. The following provides information on the planned future use of these wells.

SVE-3R

This well was overdrilled and deepened in August 2013 and currently screened from 31-41 feet bgs. It is proposed that the well will continue to be utilized as part of the SVE System.

SVE-4

The screen of SVE-4 is at a shallow depth (5-15 feet bgs) and screening results from nearby VMP wells currently show only minor concentrations of hydrocarbon vapors at shallow depths; therefore, SVE-4 is not currently operating. Future operation of this well will be determined based on future vapor monitoring results. Proposed new well SVE-44 will be located approximately 20 feet northwest of SVE-4 and will be screened deeper (25-35 feet bgs), as discussed in Section 3.1.

SVE-25

SVE-25 is located in the same vault as SVE-3R and is a shallow well with the screened interval from 10-25 feet bgs. Well SVE-25 is currently not operating since screening results show only minor concentrations of hydrocarbon vapors at shallow depths in nearby VMPs. Future operation of this well will be determined based on future vapor monitoring results.

The six proposed new wells (SVE-42 through SVE-47) will be an extension of the previously installed System "blue line" (**Figure 2** and **Figure 3**). The existing blue line wells are interconnected by aboveground 4-inch diameter carbon steel piping on the WRR North Property and underground high density polyethylene (HDPE) piping in East 4th and Chaffer Streets. The new wells will be completed in below grade vaults and connected to the existing piping using underground HDPE piping. Wells SVE- 42 through SVE-45, which will be installed in the parcels north of East 4th Street, will be connected to a common header, which will connect to the existing blue line piping within the SVE-3R/SVE-25 well vault. Wells SVE-46 and SVE-47, which will be installed in the parcel south of East 4th Street, will be connected to a common header, which will connect to the existing blue line piping in the center of East 4th Street. The underground HDPE piping will be installed with tracer wire to facilitate future line location. The proposed layout of the SVE System Extension piping is shown in **Figure 7**. Anticipated trench details and cross sections are provided in **Figure 8**. The piping configuration may be revised prior to completion of the final design based on surveying results and the results of potholing conducted to determine the actual locations and depths of the existing blue line piping and underground utilities.

The capacity of the existing System to accommodate the proposed extension of the blue line was evaluated by calculating vacuum losses in the extended blue line under current operating conditions. Vacuum losses in the blue line for the proposed System extension were evaluated at a design flow rate of 100 actual cubic feet per minute (acfm) (10 acfm per well from existing wells SVE-3R, SVE-10, SVE-11, and SVE-12 and proposed wells SVE-42 through SVE-47). The estimated vacuum loss in the longest proposed blue line pipe run (manifold to SVE-43) is approximately 8.2 in H_2O. Based on existing SVE system operation data, the blue line vacuum required at the manifold for an extraction flow rate of 100 acfm is approximately 27.6 inches of water (in H_2O). Therefore, the estimated vacuum at the SVE-43 wellhead is 19.4 in H_2O. Based on existing system operation, this vacuum is sufficient to achieve the design flow rate and radius of influence.

To evaluate the capacity of the RTO to treat additional contaminant mass recovered from the proposed System extension, the current contaminant loading on the RTO was evaluated. The additional contaminant loading from the proposed extension was then estimated and the total loading was compared with the design capacity of the RTO. The RTO is designed for a maximum volatile organic compound (VOC) loading of 10,000 parts per million by volume (ppmv) as benzene at a process flow rate of 2,000 standard cubic feet per minute (scfm) from the SVE system. The maximum RTO design loading in British Thermal Units per hour (BTU/hr) is 4,400,000 BTU/hr using a heating value of 17,500 BTU per pound (BTU/lb) for benzene. Based on measured system vapor flow rates and the results of analytical samples collected at the West Fenceline and Public Works headers, the average loading on the RTO for January through April 2014 is approximately 1,643,000 BTU/hr.

The design additional loading from each of the six proposed SVE wells was estimated to be 110 BTU per cubic foot (BTU/CF) based on the results of a soil vapor sample collected from VMP-47 at a depth of 30 feet on July 26, 2013. Using an assumed vapor flow rate of 10 scfm per new well, the potential additional loading from the SVE system extension is estimated to be 396,000 BTU/hr. Using a more conservative flow rate of 20 scfm per well, the additional loading from the SVE system extension is estimated to be 792,000 BTU/hr. Based on these estimates, the total loading on the RTO with the extension wells operating at 10 scfm per well will be 2,039,000 BTU/hr, which is approximately 54% below the RTO maximum design loading of 4,400,000 BTU/hr. At 20 scfm per new well, the estimated total loading on the RTO would still be approximately 45% below the maximum design loading at 2,435,000 BTU/hr. Therefore, the RTO has sufficient capacity to treat the additional contaminant loading from the proposed System extension.

The blue line vacuum line loss and RTO loading calculations are provided in **Appendix B**.

The existing SVE Operation and Maintenance (O&M) Plan will be updated to include the System Extension. The new SVE wells will be incorporated into the existing SVE System and included in routine monitoring and maintenance. The new wells are not anticipated to change system O&M significantly.

Shell Oil Products US. June 2011. *Conceptual/Final Design Report*. Prepared by URS Corporation.

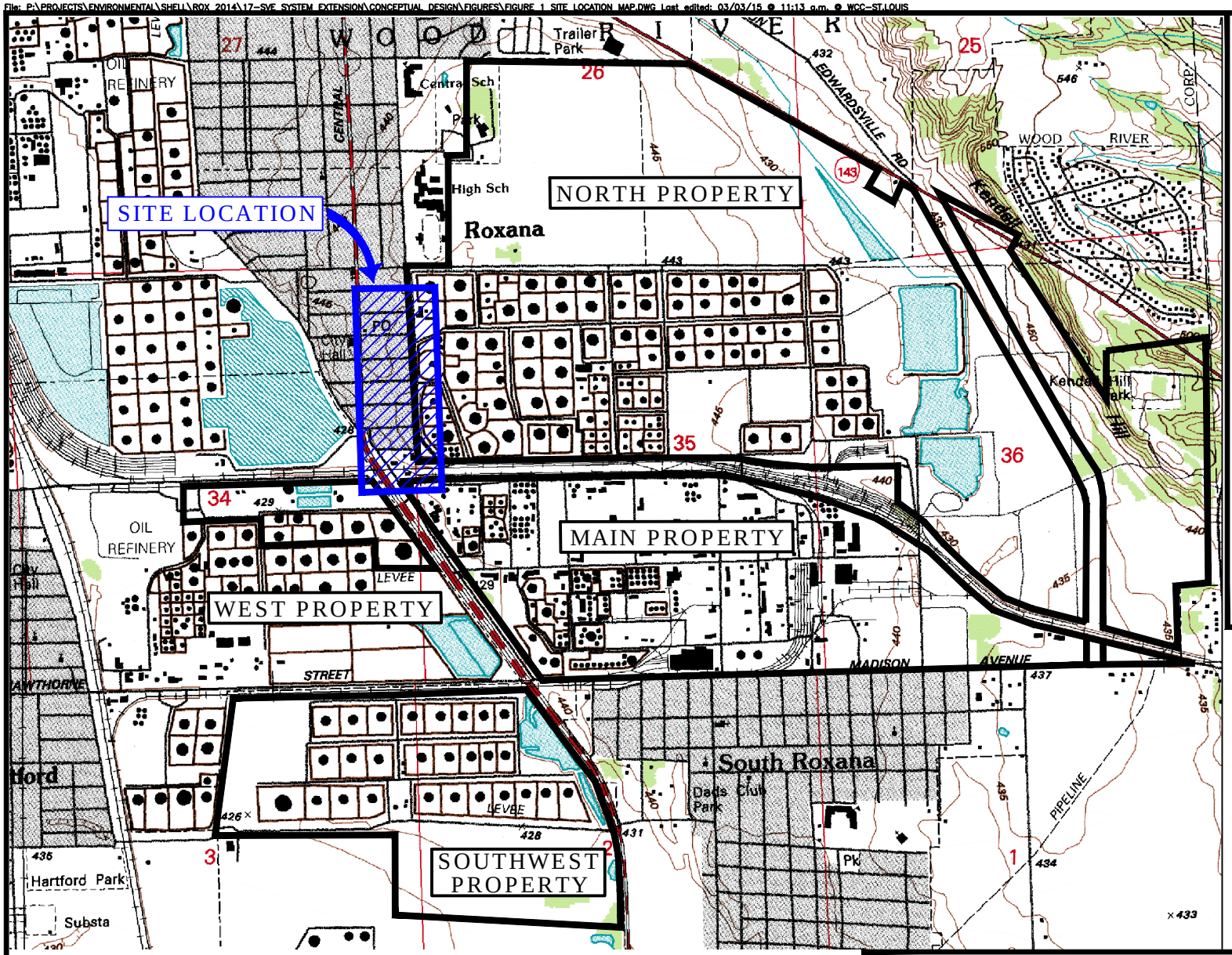
Shell Oil Products US, May 30, 2012. *SVE System Construction Completion Report.* Prepared by URS Corporation.

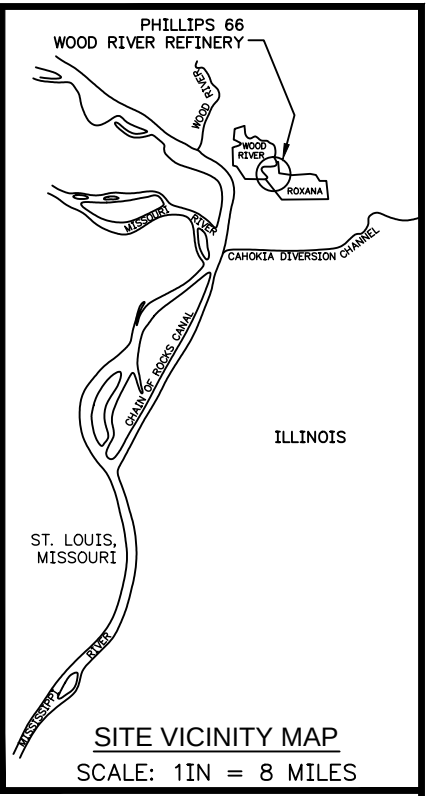
Shell Oil Products US. February 13, 2013. *SVE System Construction Completion Report Addendum*. Prepared by URS Corporation.

Shell Oil Products US. January 9, 2014. *SVE System Construction Completion Report Addendum No. 2 – SVE System Extension*. Prepared by URS Corporation.

Figures

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 1 SITE LOCATION MAP.DWG Last edited: 03/03/15 @ 11:13 a.m. @ WCC-ST.LOUIS





SITE VICINITY MAP
SCALE: 1IN = 8 MILES

LEGEND
- WOOD RIVER REFINERY PROPERTY BOUNDARY
- INVESTIGATION AREA

CONTOUR INTERVAL = 5 FT

Ø 2000
SCALE FEET

N

SOURCE:
MAP PROVIDED FROM ELECTRONIC USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE TOPOGRAPHIC MAP OF WOOD RIVER, ILL-MO REVISED 1994.

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO.
21562973

URS

DRN. BY: djd May 2014
DSGN. BY: djd
CHKD. BY: ef

Site Location Map

FIG. NO.
1

RAND AVENUE

WEST PROPERTY

(S. CENTRAL AVE) HIGHWAY 111

VILLAGE OF ROXANA

1986 APPROXIMATE BENZENE RELEASE SITE

EIGHTH ST | SEVENTH ST | SIXTH ST | FIFTH ST | FOURTH ST | THIRD ST | SECOND ST | FIRST ST | TYDEMAN AVE

CHAFFER ST

PUBLIC WORKS PROPERTY

ASPHALT PARKING

OMC BUILDING

BUILDING

METER SHELTER

CONEX

RTO

ABOVE GROUND STORAGE TANKS

MAIN PROPERTY

WOOD RIVER REFINERY

NORTH PROPERTY

LEG NO.	SVE WELLS	COLOR	WELL SYMBOL
1	SVE-5 THROUGH SVE-9 SVE-37 THROUGH SVE-41	RED	
2	SVE-3, SVE-4, SVE-25 & SVE-10 THROUGH SVE-12	BLUE	
3	SVE-13 THROUGH SVE-19 & SVE-36	GREEN	
4	SVE-20 THROUGH SVE-27	TEAL	
5	SVE-28 THROUGH SVE-33	PURPLE	
6	SVE-34 THROUGH SVE-35	BROWN	

LEGEND:

- SVE EXTRACTION WELL (SEE TABLE FOR COLOR LEGEND)
- VAPOR MONITORING POINT (VMP)
- PROPERTY BOUNDARY
- UNDERGROUND PIPING

Ø 200

SCALE FEET

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO. 21562973

URS

DRN. BY: djd May 2014
DSGN. BY: lv
CHKD. BY: ef

Soil Vapor Extraction System
Overall Plan

FIG. NO. 2

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 2 SOIL VAPOR EXTRACTION SYSTEM OVERALL PLANLING Last edited: MAR. 03, 15 @ 12:27 p.m. by: dsfid_degure

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 3 PROPOSED SVE WELLS NEAR 4TH AND CHAFFER STREETS.DWG Last edited: MAR. 03, 15 @ 12:28 p.m. by: david_deguire

LEGEND

- PROPOSED SVE WELL ASSUME 30' OR 60' ROI
- EXSTING SHALLOW SVE WELL
- EXSTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- APPROXIMATE BOUNDARY OF FORMER RESIDENTIAL PROPERTY CURRENTLY OWNED BY SOPUS
- WRB REFINING LP PROPERTY BOUNDARY
- EXISTING RED LINE
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)
- EXISTING GREEN LINE
- EXISTING TEAL LINE
- EXISTING PURPLE LINE
- EXISTING BROWN LINE

PROPOSED SVE WELLS	
Well No.	**Screened Interval (ft. bgs)**
SVE-42	25-35
SVE-43	25-35
SVE-44	25-35
SVE-45	37-42
SVE-46	15-25
SVE-47	15-25
EXISTING SVE WELLS	
Well No.	**Screened Interval (ft. bgs)**
SVE-3R	31-41
SVE-4*	5-15
SVE-7*	10-20
SVE-8	9-19
SVE-9	10-20
SVE-10	10-20
SVE-11	10-20
SVE-25*	10-25
SVE-29	20-30
SVE-30	25-35
SVE-31	25-35
SVE-32	25-35
SVE-33	25-35

NOTES:
1. ALL PROPOSED SVE WELLS TO BE LOCATED WITHIN THE PROPERTY BOUNDARIES OF PARCELS OWNED BY SOPUS.
2. * SVE WELLS CURRENTLY NOT IN OPERATION. FUTURE OPERATION OF THESE WELLS WILL BE DEPENDANT ON SITE CONDITIONS.

CHAFFER ST
THIRD ST
FOURTH ST
FIFTH ST
VILLAGE OF ROXANA
EXISTING GARAGE
146
147
150
CONCRETE WALK
SEWER
WATER
NATURAL GAS
FORMER HOUSE FOOTPRINT
P-60-11
ROST-4-PZ(B)
SVE-28
VMP-46
ROST-4-PZ(C)
ROST-4-PZ(D)
ROST-4-PZ
ROST-4
GWP-4
SVE-7
VMP-42
ROST-4-PZ(E)
SVE-29
GP-15
P-60-S
P-60-12
P-60
P-60-12S
ROST-4-PZ(F)
P-60-13
ROST-29
P-60-13S
SVE-8
ROST-5-PZ
ROST-5
VMP-49
ROST-4-PZ(G)
VMP-3
GWP-5
SVE-43
SVE-42
ROST-32
ROST-31
SVE-30
ROST-33
ROST-34
ROST-35
VMP-35
SVE-9
ROST-15
ROST-36
ROST-37
SVE-45
MW-17
T-12
SVE-44
VMP-56
VMP-32
SVE-4
SVE-3R
SVE-25
VMP-43
SVE-31
ROST-16
ROST-7
MW-22
ROST-7-PZ
ROST-8
GWP-6
ROST-38
SVE-46
SVE-10
VMP-26
ROST-39
ROST-40
SVE-1
ROST-41
ROST-42
SVE-47
MW-18
SVE-32
VMP-22
GWP-14
VMP-50
ROST-9
GWP-7
VMP-4
ROST-17
SVE-11
VMP-28
ROST-26
SVE-33
VMP-36
MW-19
P-59
SVE-12
ROST-21
GWP-8

SCALE 0 50 FEET
N

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21562973
URS	
DRN. BY: djd May 2014 DSGN. BY:ef CHKD. BY:ef	Proposed SVE Wells Near 4th & Chaffer Streets
	FIG. NO. 3

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 4 GEOLOGIC CROSS SECTION TRACES.DWG Last edited: MAR. 03, 15 @ 12:30 p.m. by: david_deguire

LEGEND

- PROPOSED SVE WELL SCREEN INTERVAL VARIES
- EXSTING SHALLOW SVE WELL
- EXSTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- APPROXIMATE AREA OF TOTAL FLUORESCENCE GREATER THAN 2% ABOVE THE WATER TABLE (ELEVATION ~ 4Ø1FT NGVD 88)

NOTE:
ALL PROPOSED SVE WELLS TO BE LOCATED WITHIN THE PROPERTY BOUNDARIES OF PARCELS OWNED BY SOPUS.

ROST-4-PZ(E)
ROST-4-PZ(F)
ROST-4-PZ(G)
ROST-5-PZ
ROST-5
ROST-29
ROST-32
ROST-31
ROST-33
ROST-34
ROST-35
ROST-36
ROST-37
ROST-38
ROST-39
ROST-40
ROST-41
ROST-42
ROST-8
ROST-9
ROST-16
ROST-17
VMP-49
VMP-3
VMP-56
VMP-32
VMP-43
VMP-50
VMP-4
VMP-26
VMP-28
SVE-29
SVE-43
SVE-42
SVE-45
SVE-44
SVE-4
SVE-3R
SVE-25
SVE-46
SVE-47
SVE-30
SVE-9
SVE-31
SVE-10
SVE-1
SVE-32
SVE-11
SVE-8
GP-15
P-60-S
P-60-12
P-60-12S
P-60
P-60-13
P-60-13S
GWP-5
GWP-6
GWP-7
MW-17
MW-18
T-12
A
A'
B
B'
146
147
150
EXISTING GARAGE
CHAFFER ST
CONCRETE WALK
FOURTH ST
SEWER
WATER
NATURAL GAS
FORMER HOUSE FOOTPRINT
VILLAGE OF ROXANA

SCALE Ø 3Ø FEET

N

SHELL OIL PRODUCTS US ROXANA, ILLINOIS		PROJECT NO. 21562973
URS		
DRN. BY: djd May 2014 DSGN. BY: ef CHKD. BY: ef	Geologic Cross Section Locations & Plan View of Total Fluorescence >2%	FIG. NO. 4

A (SOUTH) A' (NORTH)

ROST-42 ROST-39 ROST-37 ROST-34 ROST-32

SVE-47 SVE-46 SVE-45 SVE-43

ELEVATION, FEET NGVD 88

445 435 425 415 405 395 385 375 365

Silt

Sand

Clay

APPROXIMATE WATER TABLE

LEGEND

TOTAL FLUORESCENCE GREATER THAN 2%

NOTE:
PROPOSED SVE WELLS WERE PROJECTED ONTO CROSS SECTION TO SHOW SCREEN PLACEMENT RELATIVE TO TOTAL ROST FLUORESCENCE GREATER THAN 2%.

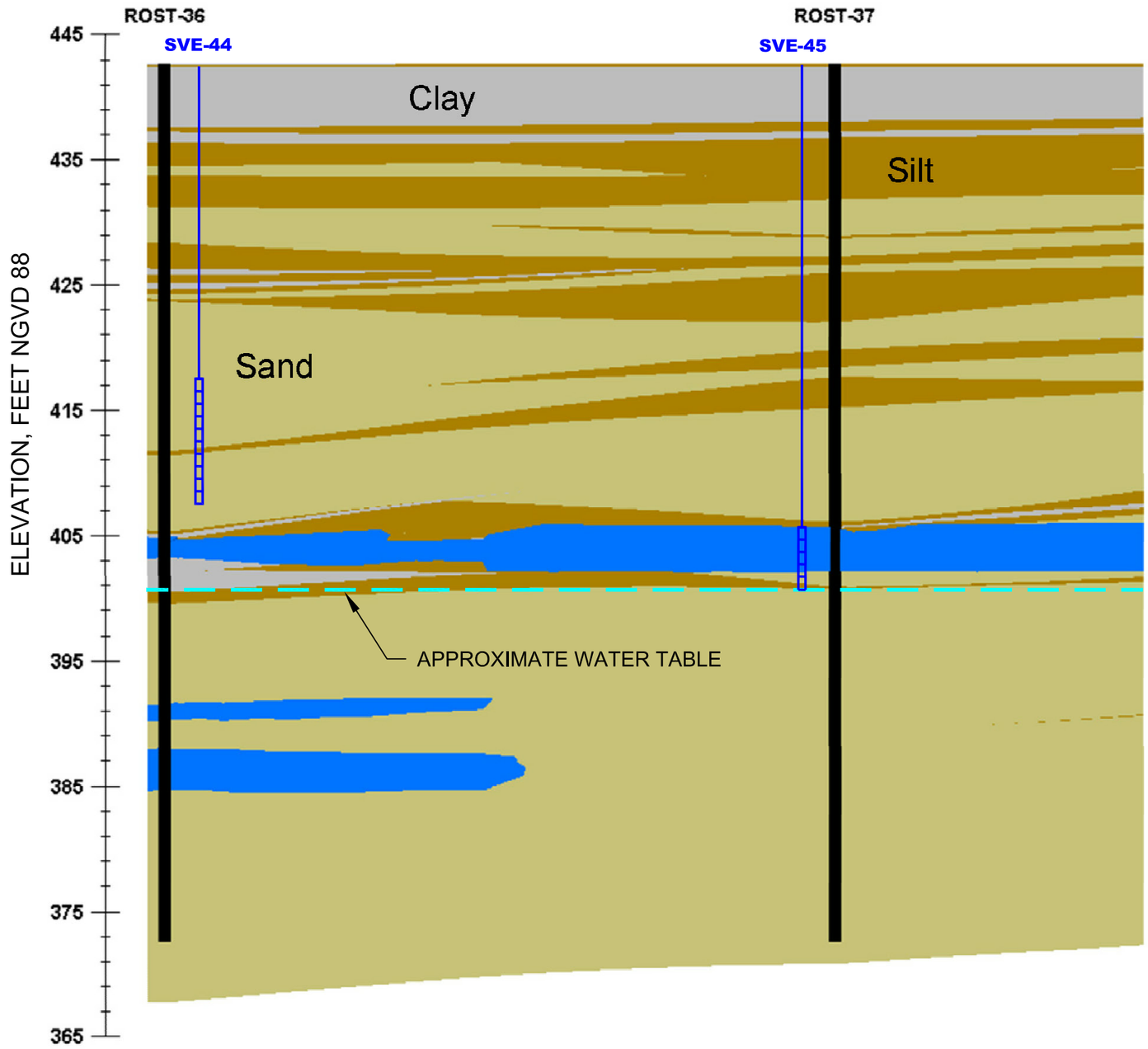
Ø 10

APPROXIMATE VERTICAL SCALE FEET
HORIZONTAL NOT TO SCALE

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21562973
URS	
DRN. BY: djd May 2014 DSGN. BY: djd CHKD. BY: ef	Cross Section A–A'
	FIG. NO. 5

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 5 CROSS SECTION A-A.DWG Last edited: 03/03/15 ● 12:34 p.m. ● WCC-STLOUIS

B (WEST) B' (EAST)



LEGEND

TOTAL FLUORESCENCE GREATER THAN 2%

NOTE:
PROPOSED SVE WELLS WERE PROJECTED ONTO CROSS SECTION TO SHOW SCREEN PLACEMENT RELATIVE TO TOTAL ROST FLUORESCENCE GREATER THAN 2%.

Ø 10Ø

APPROXIMATE VERTICAL SCALE FEET
HORIZONTAL NOT TO SCALE

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21562973
URS	
DRN. BY: djd May 2014 DSGN. BY: djd CHKD. BY: ef	Cross Section B–B'
	FIG. NO. 6

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 6 CROSS SECTION B-B.DWG Last edited: 03/03/15 ● 12:36 p.m. ● WCC-ST.LOUIS

File: P:\ENVIRONMENTAL\SHELL OIL PRODUCTS US 2014\3-ROXANA\06_SVE SYSTEM O&M\12-SVE EXTENSION\4TH STREET\FIGURES\FIGURE 7 PROPOSED SVE PIPING NEAR 4TH AND CHAFFER STREETS.DWG Last edited: MAY 22, 14 @ 3:37 p.m. by: david_deguire

LEGEND

- PROPOSED SVE WELL SCREEN INTERVAL VARIES
- EXISTING SHALLOW SVE WELL
- EXISTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- PROPOSED SVE PIPING (UNDERGROUND)
- APPROXIMATE BOUNDARY OF FORMER RESIDENTIAL PROPERTY CURRENTLY OWNED BY SOPUS
- WRB REFINING LP PROPERTY BOUNDARY
- EXISTING RED LINE
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)
- EXISTING GREEN LINE
- EXISTING TEAL LINE
- EXISTING PURPLE LINE
- EXISTING BROWN LINE

NOTE:
ALL PROPOSED SVE WELLS TO BE LOCATED WITHIN THE PROPERTY BOUNDARIES OF PARCELS OWNED BY SOPUS.

CHAFFER ST
THIRD ST
FOURTH ST
FIFTH ST
ROST-4-PZ(B)
ROST-4-PZ(C)
ROST-4-PZ(D)
ROST-4-PZ
ROST-4
GWP-4
VMP-42
ROST-4-PZ(E)
ROST-4-PZ(F)
SEWER
GWP-13
ROST-20
ROST-4-PZ(G)
VMP-49
ROST-5-PZ
ROST-5
VMP-3
GWP-5
SVE-43
SVE-42
ROST-32
ROST-31
EXISTING GARAGE
ROST-33
ROST-34
ROST-35
146
150
ROST-36
ROST-37
SVE-45
SVE-44
VMP-31
MW-17
VMP-56
WATER
VMP-32
SVE-4
SVE-3R
SVE-25
VMP-43
ROST-8
GWP-6
ROST-7
MW-22
ROST-7-PZ
NATURAL GAS
FORMER HOUSE FOOTPRINT
SVE-46
ROST-38
VILLAGE OF ROXANA
147
ROST-39
ROST-40
ROST-41
ROST-42
SVE-47
MW-18
SEWER
VMP-22
GWP-14
VMP-50
ROST-9
GWP-7
VMP-4
MW-19
ROST-21
GWP-8
P-60-11
SVE-28
VMP-46
P-60-11
SVE-7
SVE-29
GP-15
P-60-S
P-60-12
P-60
P-60-12S
ROST-29
P-60-13
P-60-13S
SVE-8
SVE-30
VMP-35
SVE-9
ROST-15
T-12
SVE-31
ROST-16
VMP-26
SVE-10
SVE-1
SVE-32
ROST-17
SVE-11
VMP-28
ROST-26
SVE-33
VMP-36
P-59
SVE-12

SCALE 0 50 FEET
N

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

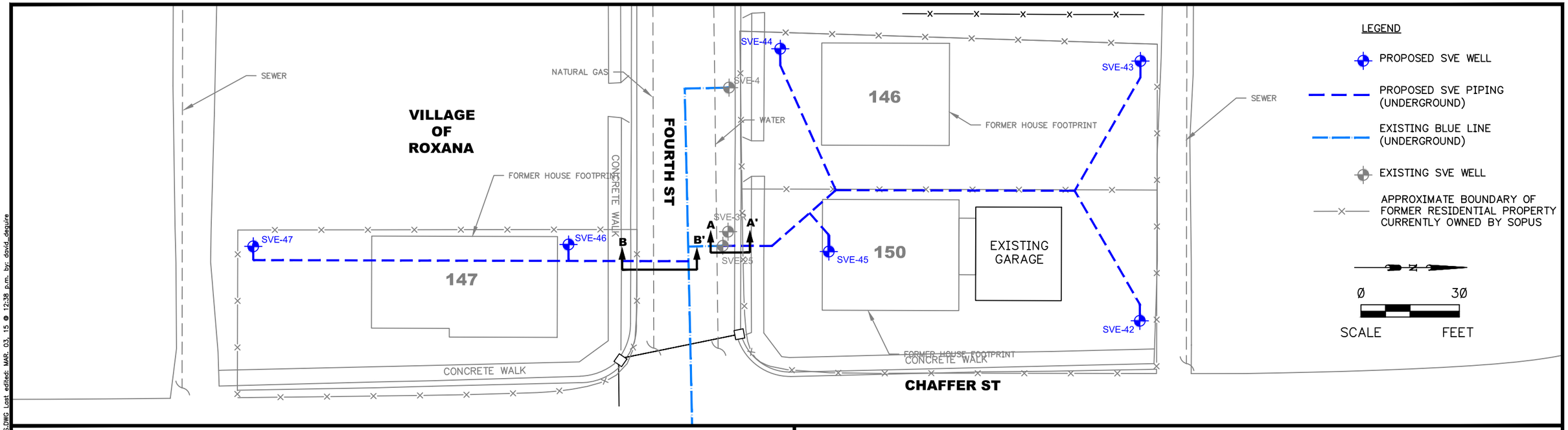
PROJECT NO. 21562973

URS

DRN. BY: djd May 2014
DSGN. BY: ef
CHKD. BY: ef

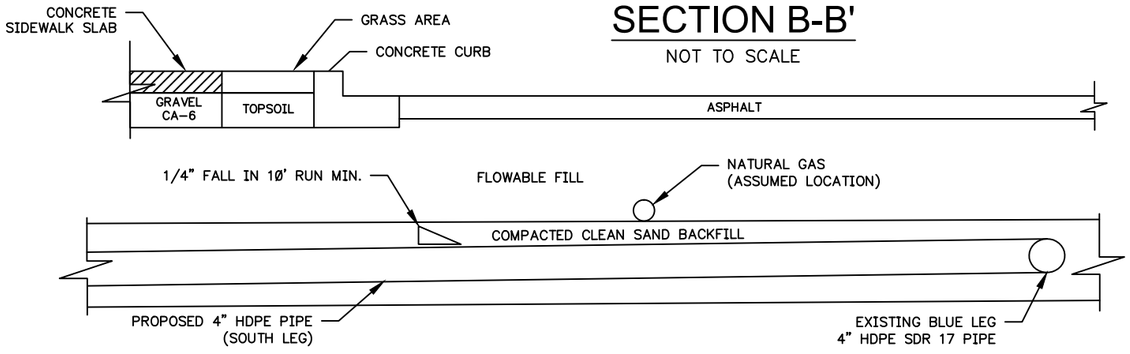
Proposed SVE Piping Near 4th & Chaffer Street

FIG. NO. 7



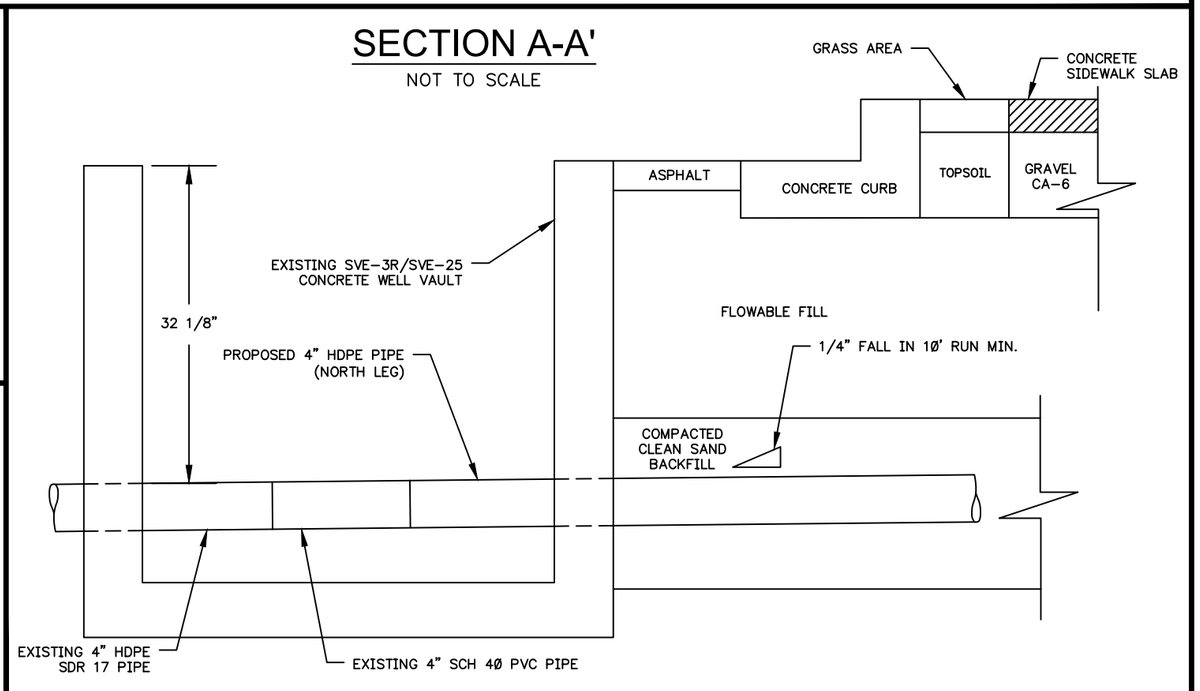
SECTION B-B'

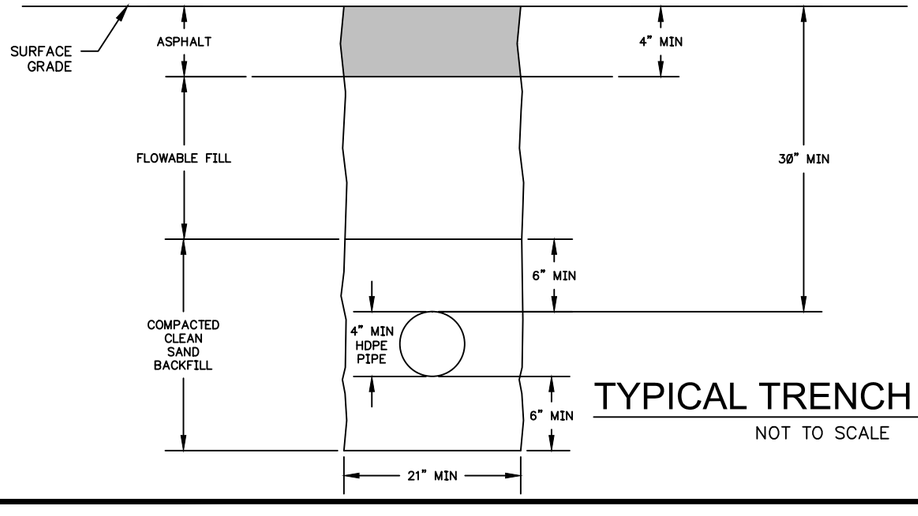
NOT TO SCALE



SECTION A-A'

NOT TO SCALE





TYPICAL TRENCH DETAIL

NOT TO SCALE

NOTES:

1. LOCATIONS AND DEPTHS OF THE EXISTING BLUE LEG PIPE AND THE UNDERGROUND NATURAL GAS LINE TO BE DETERMINED BY POTHOLING PRIOR TO COMPLETION OF THE BLUE LEG EXTENSION FINAL DESIGN.
2. PAVEMENT, CURB, AND SIDEWALK WILL BE RESTORED TO MATCH EXISTING CONDITIONS.
3. FINAL DESIGN SUBJECT TO FIELD OBSERVATIONS/CONDITIONS.

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO. 21562973

URS

DRN. BY: djd May 2Ø14
DSGN. BY: ef
CHKD. BY: ef

Cross Sections and Trench Detail

FIG. NO. 8

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\V7-SVE SYSTEM EXTENSION\CONCEPTUAL DESIGN\FIGURES\FIGURE 8 SVE SYSTEM EXTENSION PIPING INSTALLATION DETAILS.DWG Last edited: MAR. 03, 15 @ 12:38 p.m. by: david_deguire

Appendices

Appendix A – CPT and ROST™ Logs

Appendix B – Vacuum Loss and RTO Capacity Calculations

FUGRO GEOSCIENCES,INC.

CPT No : ROST-05	SITE : Roxana,IL
JOB No : 04.1909-0044	CLIENT : URS Corporation
CONE No : F7.5CKE2HAW21344	OPERATOR : DANIEL GARZA
	DATE : 25-Aug-2009

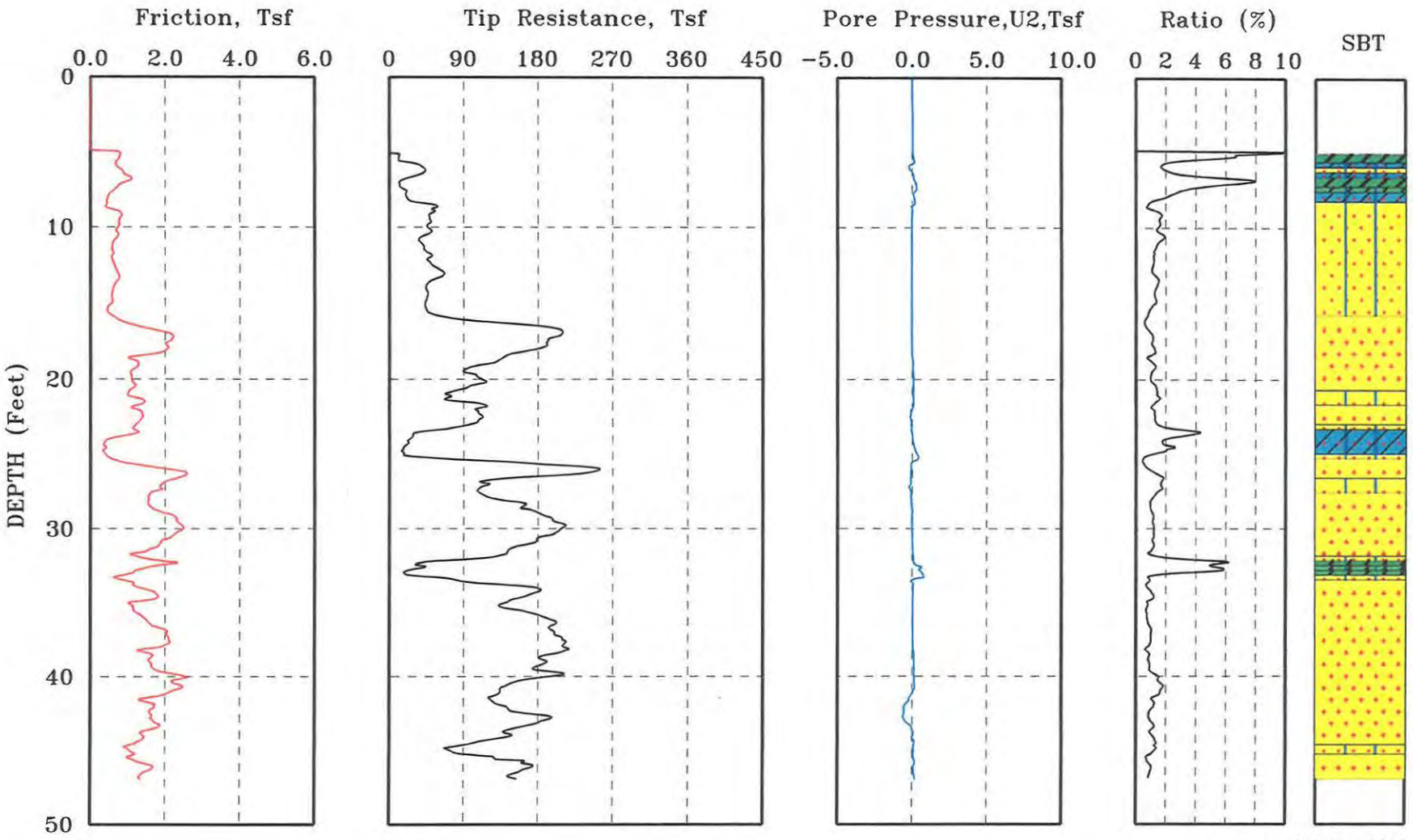
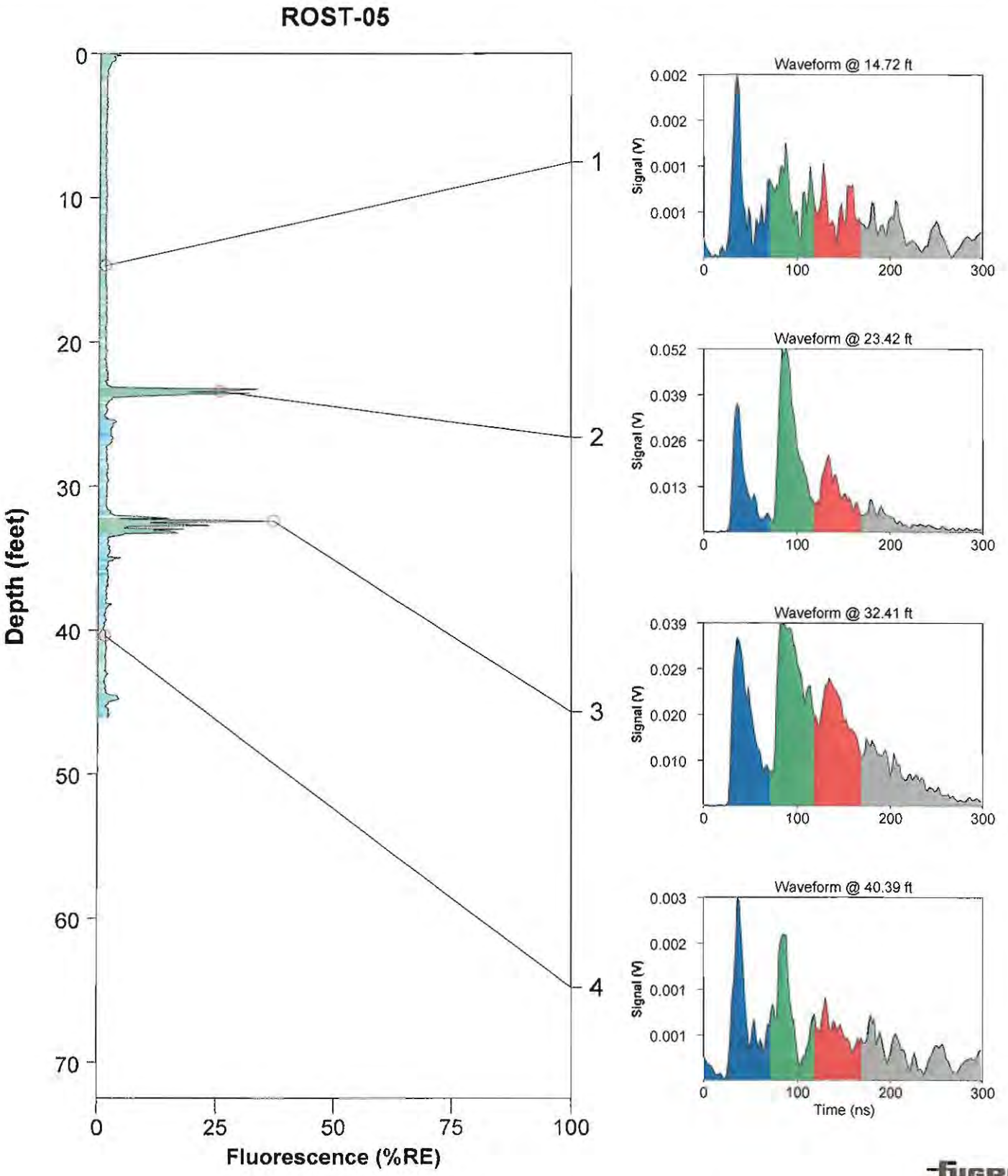


PLATE: 1 of 1

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\Conceptual Design\FINAL

ROST Fluorescence Response Data

Site: Connoco-Roxana,IL	Operator: Robert Biehle
Client: URS	Fugro Job #: 04.1909-0044
Date/Time: 8/25/2009 @ 5:29:23 PM	Max fluorescence: 37.25% @ 32.41 ft
ROST Unit: Houston	Final depth BGS: 46.12 ft



Fugro Geosciences, Inc., 6105 Rookin, Houston, TX 77074 (713) 346-4000 www.geo.fugro.com

FUGRO GEOSCIENCES,INC.

CPT No : ROST-08	SITE : Roxana,IL
JOB No : 04.1909-0044	CLIENT : URS Corporation
CONE No : F7.5CKE2HAW21344	OPERATOR : DANIEL GARZA
	DATE : 26-Aug-2009

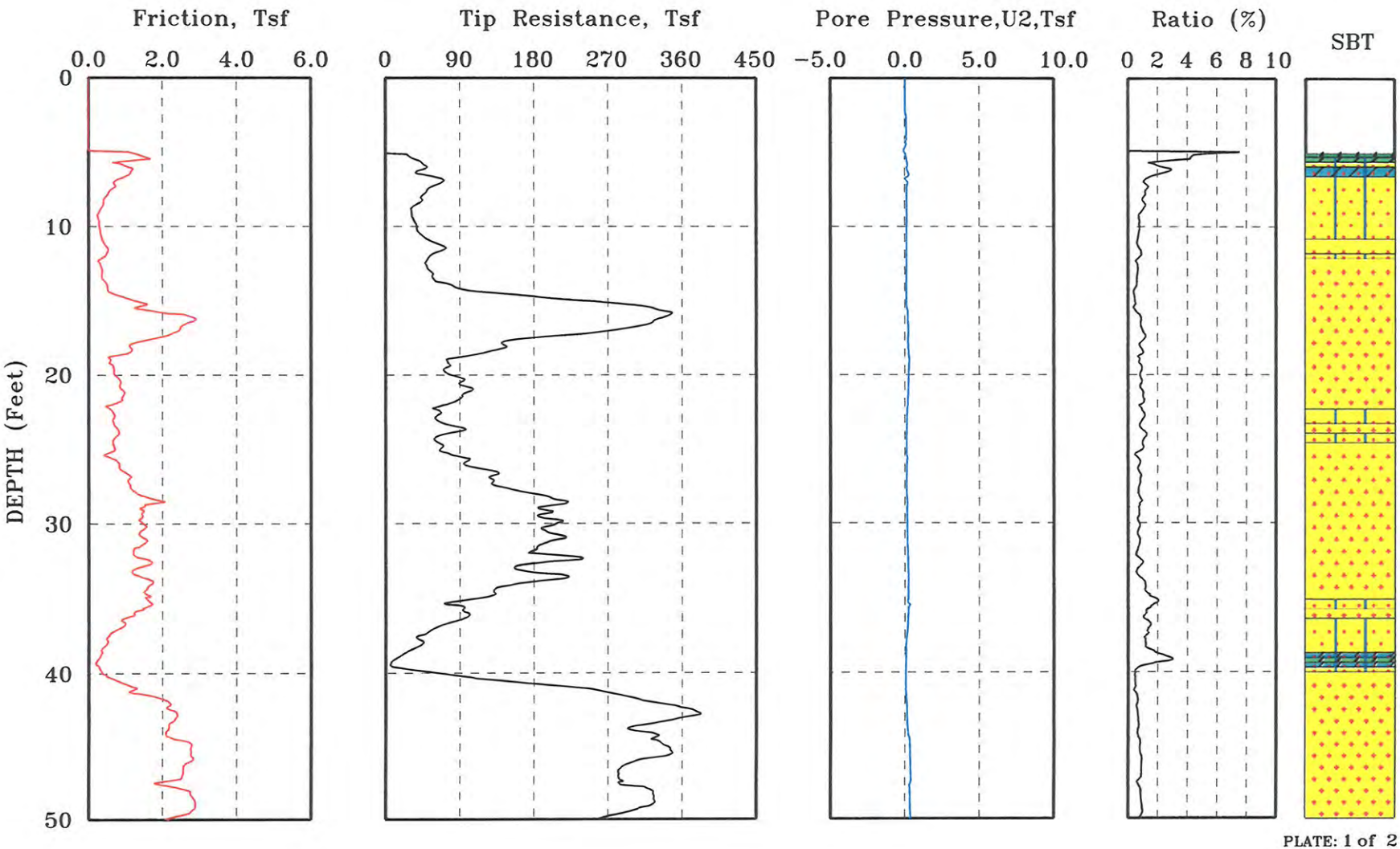


PLATE: 1 of 2

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\Conceptual Design\FINAL

FUGRO GEOSCIENCES,INC.

CPT No : ROST-08	SITE : Roxana,IL
JOB No : 04.1909-0044	CLIENT : URS Corporation
CONE No : F7.5CKE2HAW21344	OPERATOR : DANIEL GARZA
	DATE : 26-Aug-2009

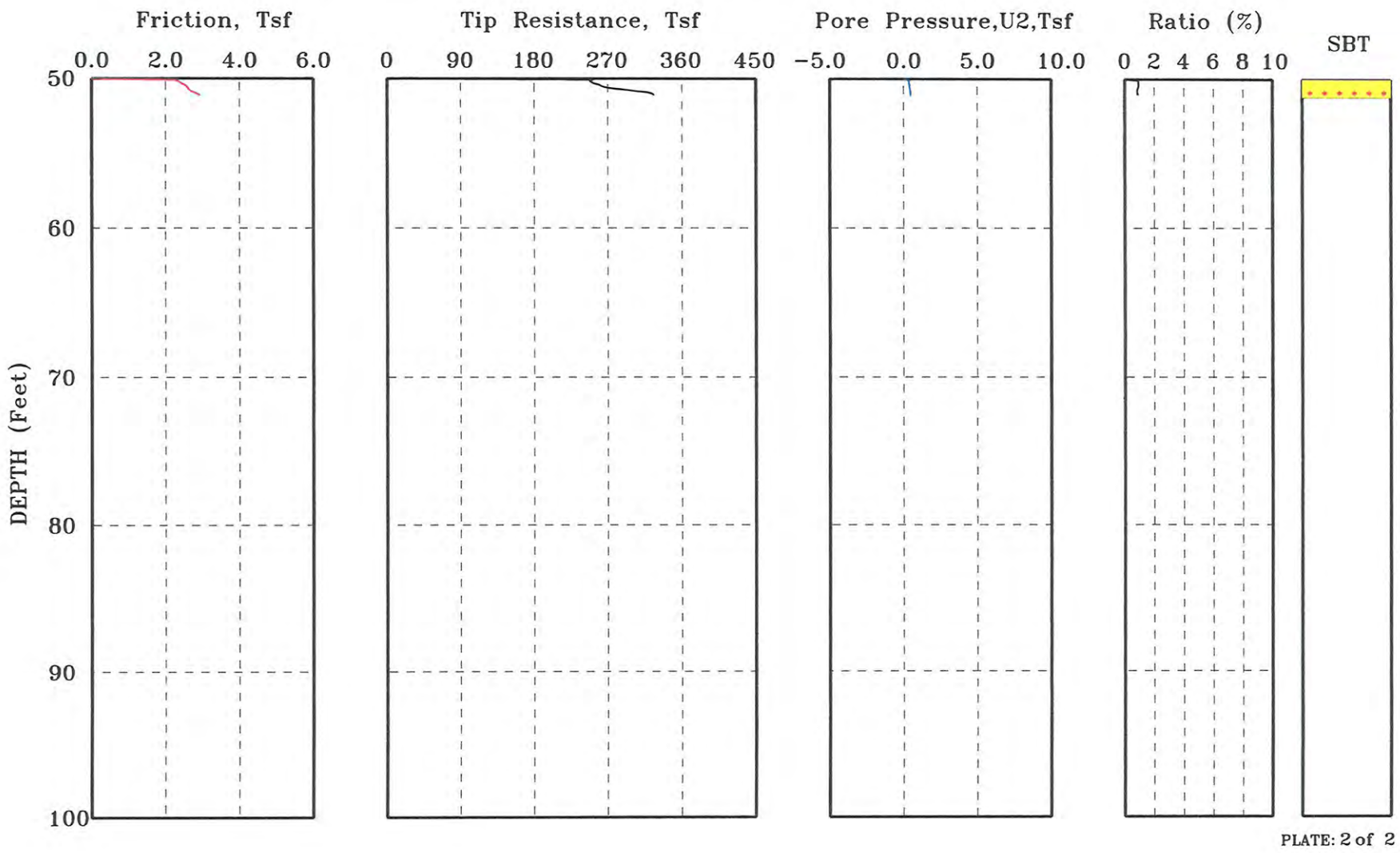
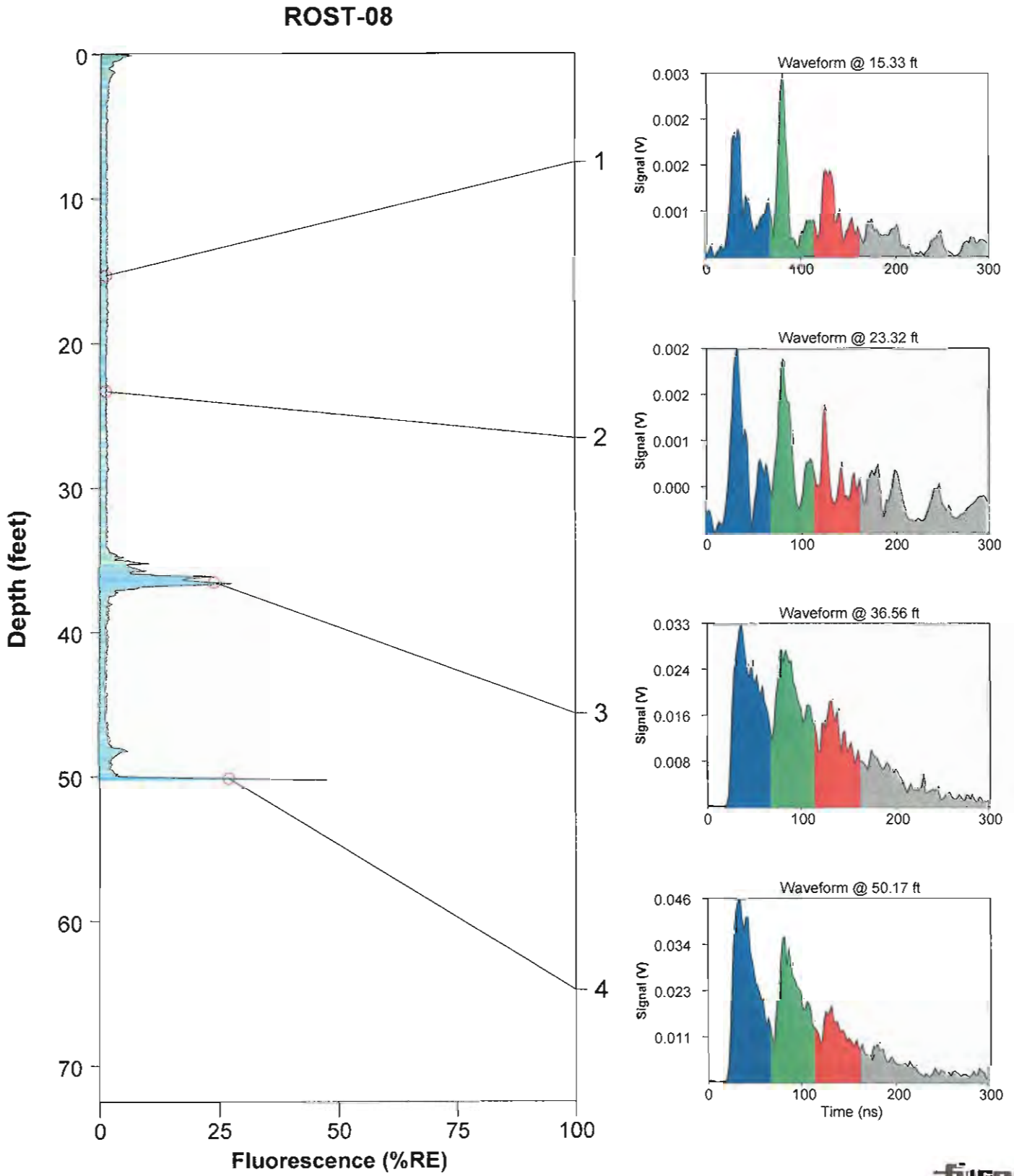


PLATE: 2 of 2

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\Conceptual Design\FINAL

ROST Fluorescence Response Data

Site: Conoco-Roxanna,IL	Operator: Robert Biehle
Client: URS	Fugro Job #: 04.1909-0044
Date/Time: 8/26/2009 @ 9:31:38 AM	Max fluorescence: 47.57% @ 50.27 ft
ROST Unit: Houston	Final depth BGS: 50.27 ft



Fugro Geosciences, Inc., 6105 Rookin, Houston, TX 77074 (713) 346-4000 www.geo.fugro.com

FUGRO GEOSCIENCES,INC.

CPT No : ROST-09	SITE : Roxana,IL
JOB No : 04.1909-0044	CLIENT : URS Corporation
CONE No : F7.5CKE2HAW21344	OPERATOR : DANIEL GARZA
	DATE : 26-Aug-2009

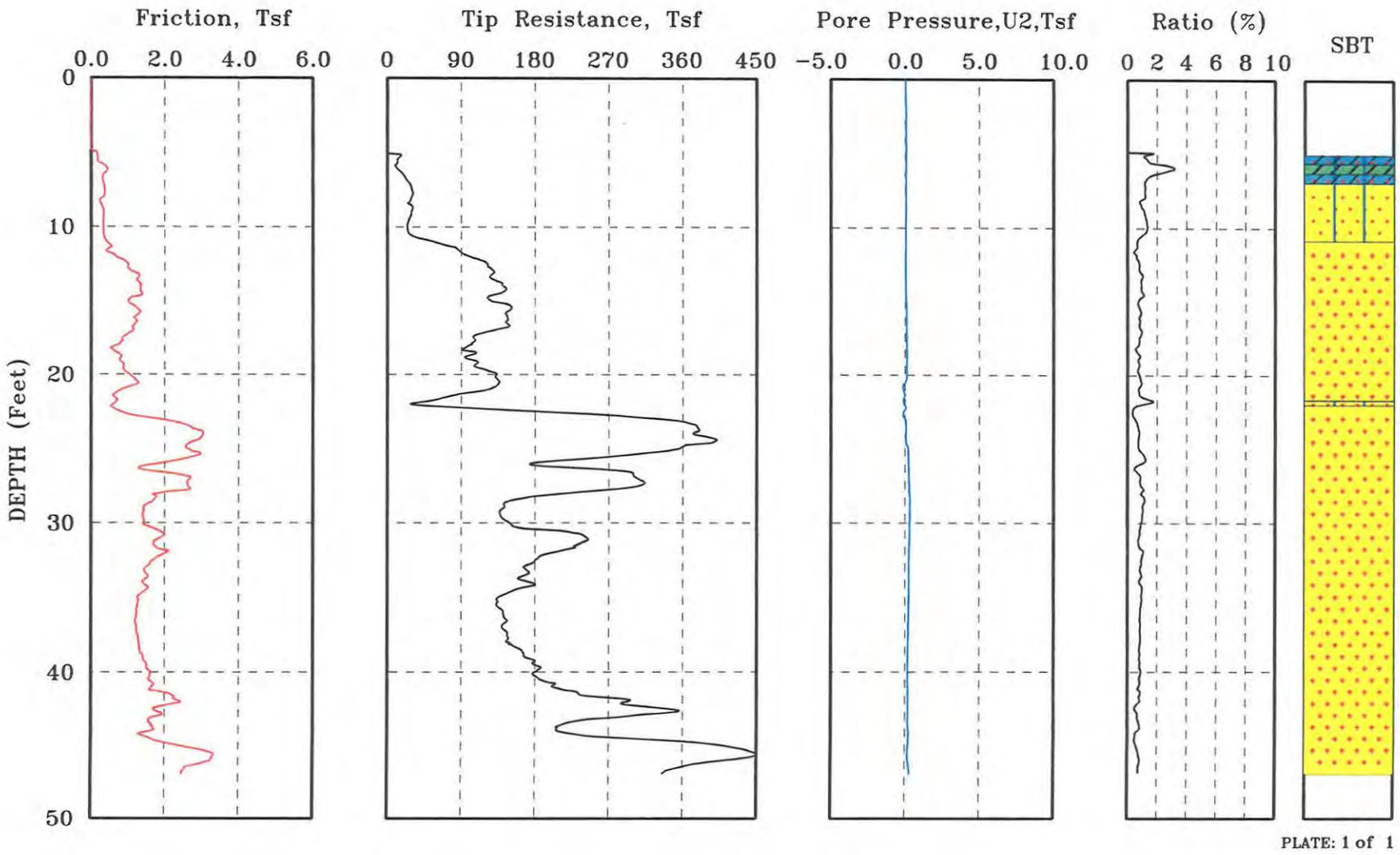
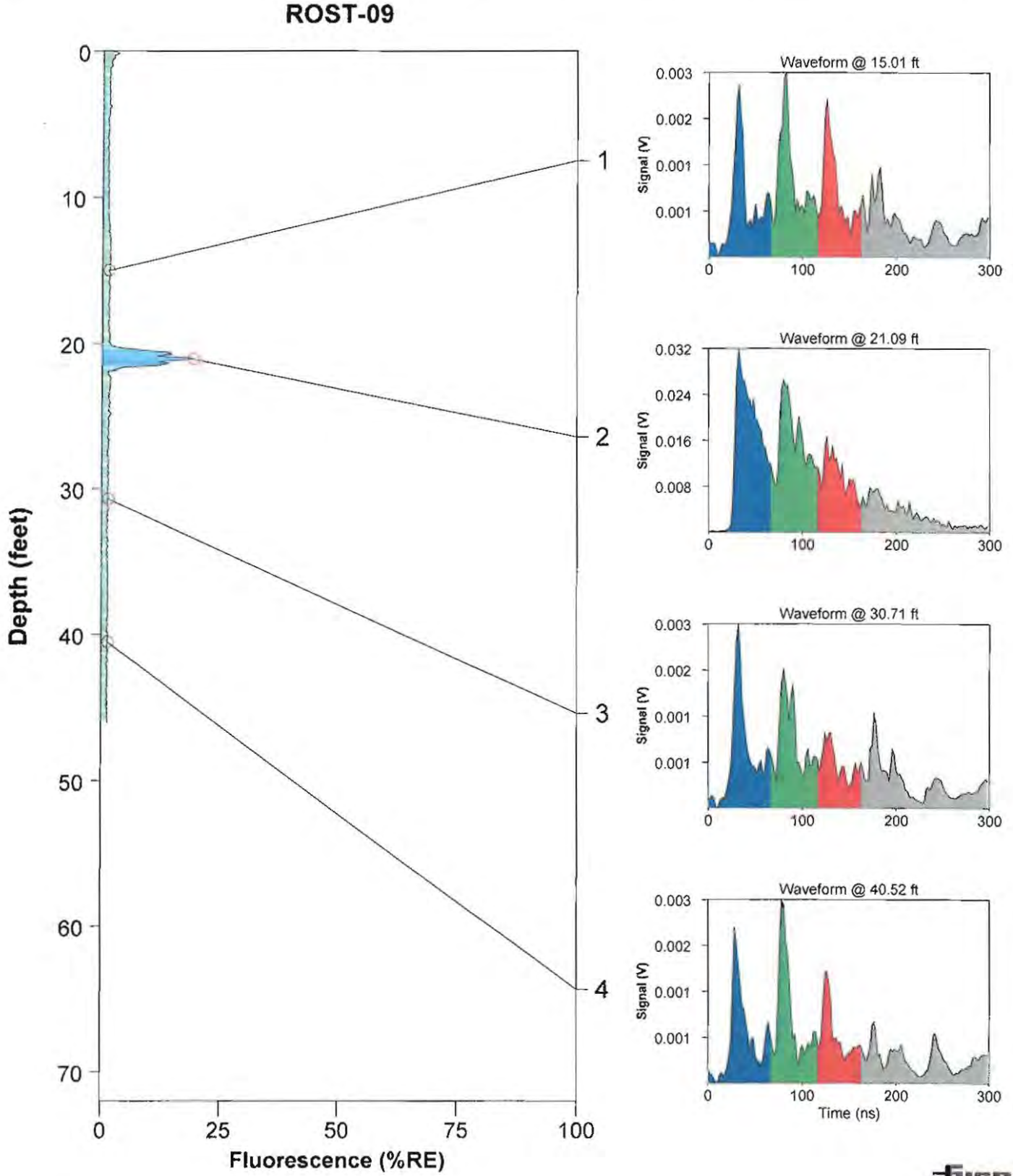


PLATE: 1 of 1

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\Conceptual Design\FINAL

ROST Fluorescence Response Data

Site: Conoco-Roxana,IL	Operator: Robert Biehle
Client: URS	Fugro Job #: 04.1909-0044
Date/Time: 8/26/2009 @ 10:29:41 AM	Max fluorescence: 19.34% @ 21.09 ft
ROST Unit: Houston	Final depth BGS: 46.05 ft



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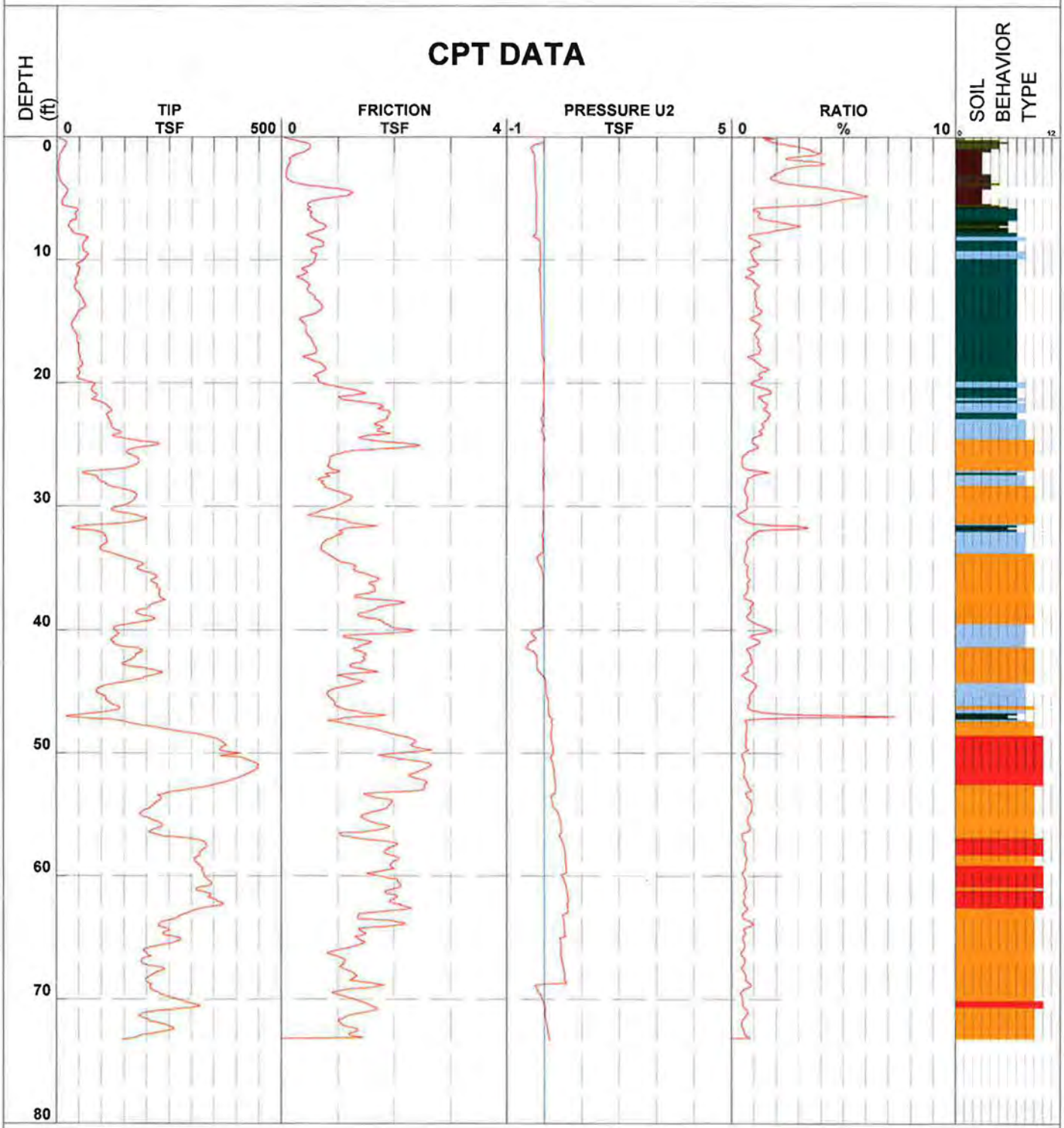
FUGRO

Job Number 04.1913-0025 CPT Number ROST-31 Location Roxana, Illinois

Operator Robert Biehle Date and T 08-May-2013 09:17:59 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

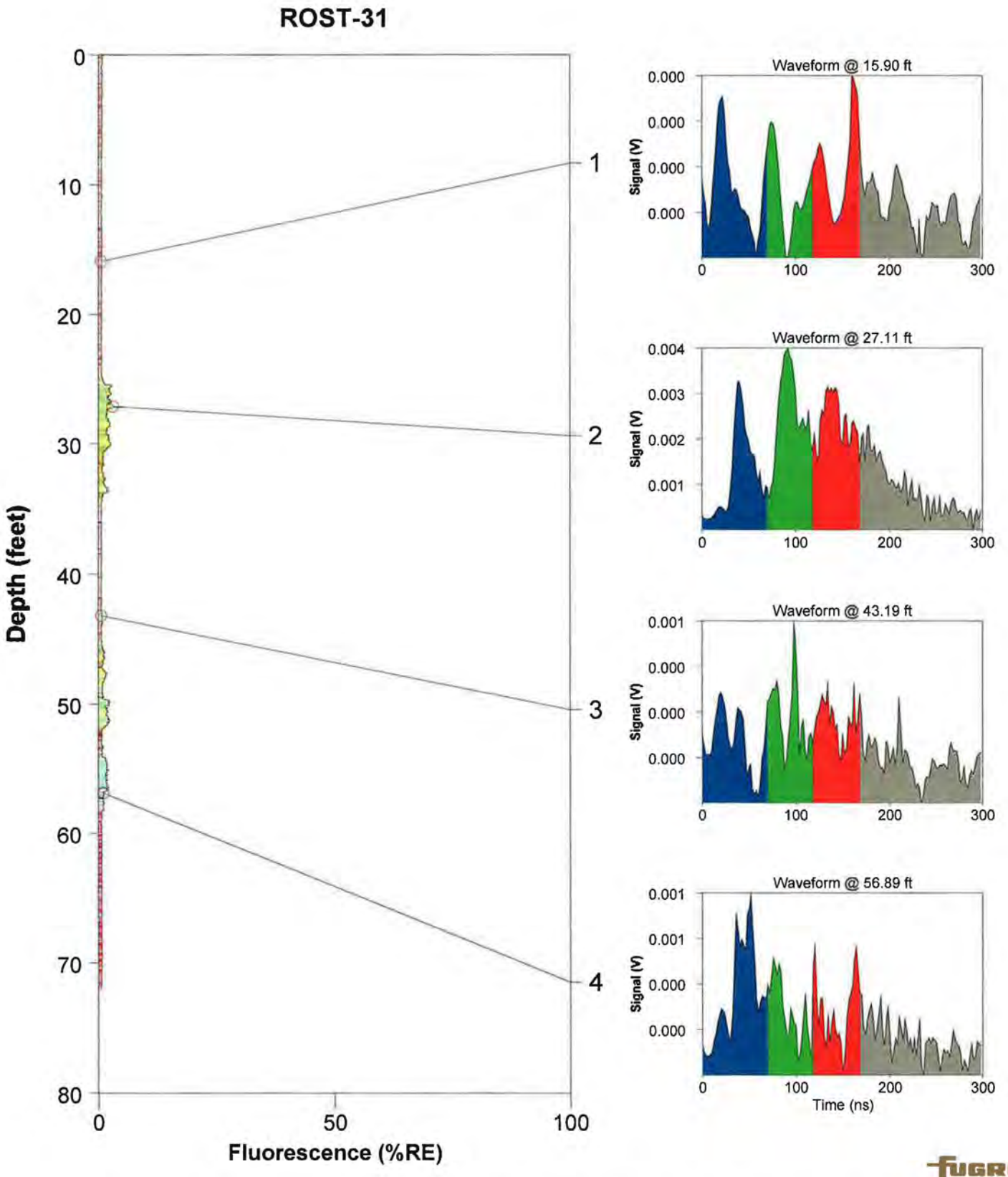
■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\Conceptual Design\FINAL

Robertson et al. 1986 * Overconsolidated or Cemented

ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/8/2013 @ 9:17:48 AM	Max fluorescence: 5.21% @ 27.18 ft
ROST Unit: Houston	Final depth BGS: 72.00 ft

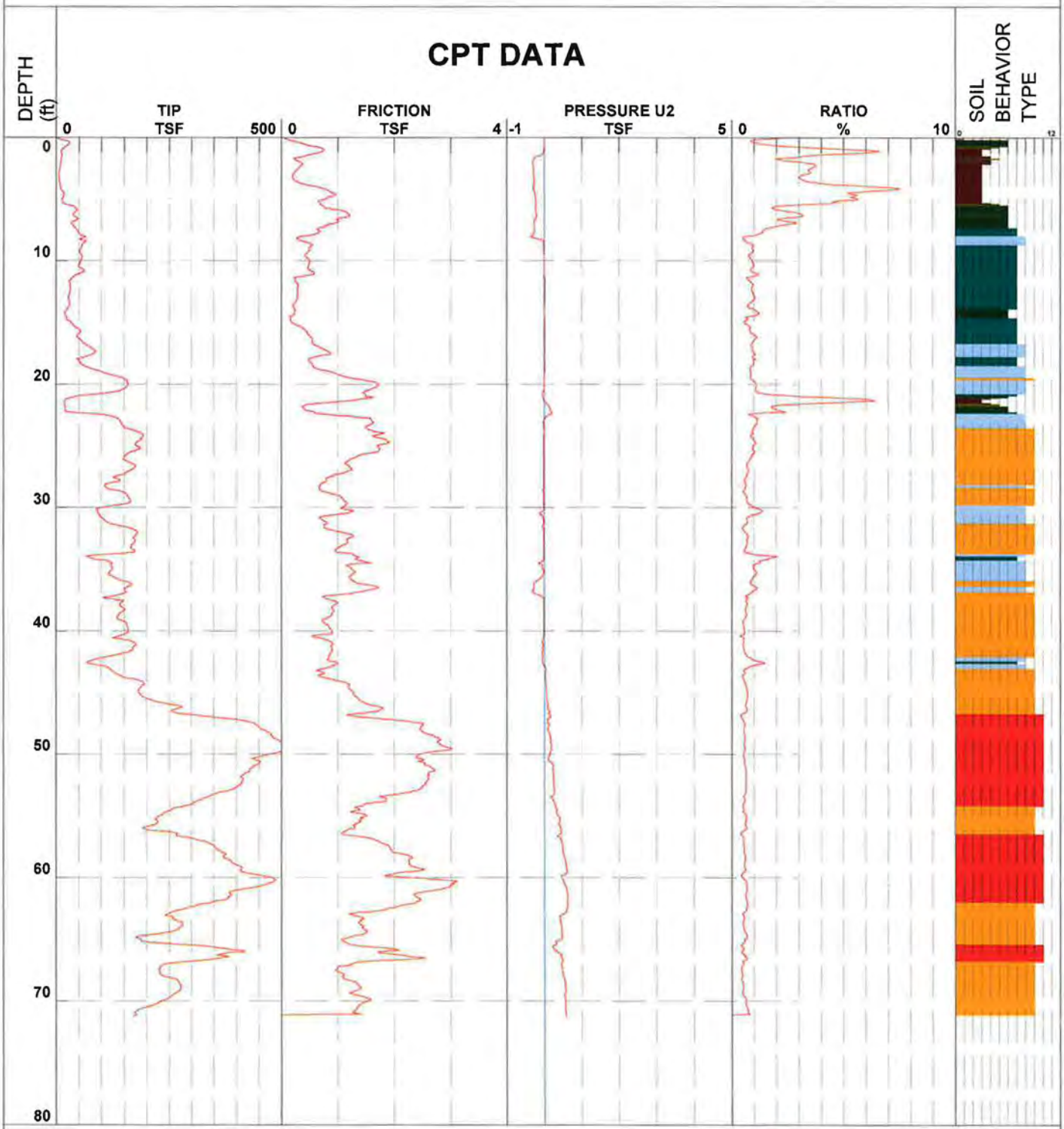


Job Number 04.1913-0025 CPT Number ROST-32 Location Roxana, Illinois

Operator Robert Biehle Date and T 09-May-2013 11:12:49 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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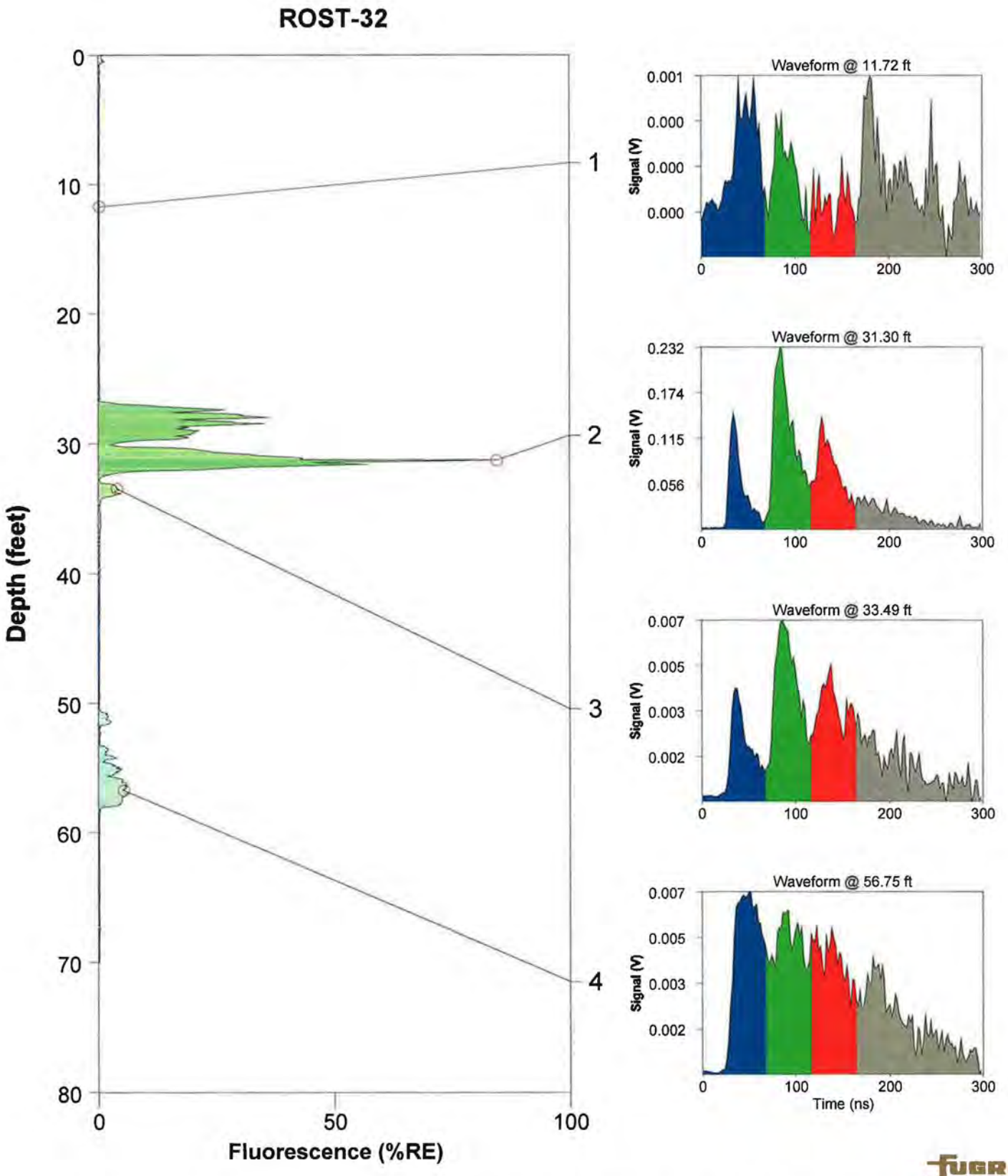
ROST Fluorescence Response Data

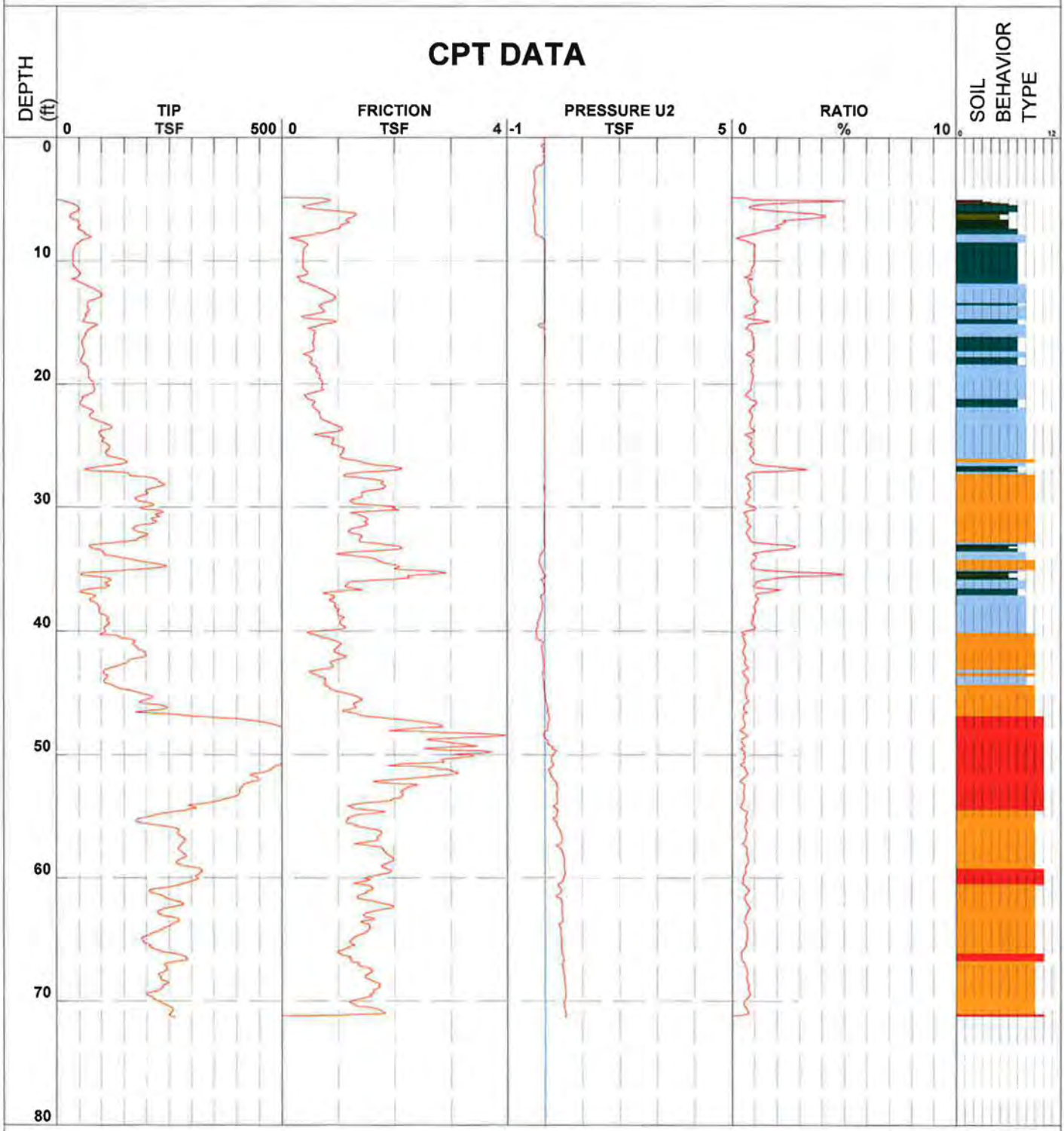
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/9/2013 @ 11:13:57 AM	Max fluorescence: 84.57% @ 31.30 ft
ROST Unit: Houston	Final depth BGS: 70.02 ft



Job Number 04.1913-0025 CPT Number ROST-33 Location Roxana, Illinois

Operator Robert Biehle Date and T 09-May-2013 08:37:10 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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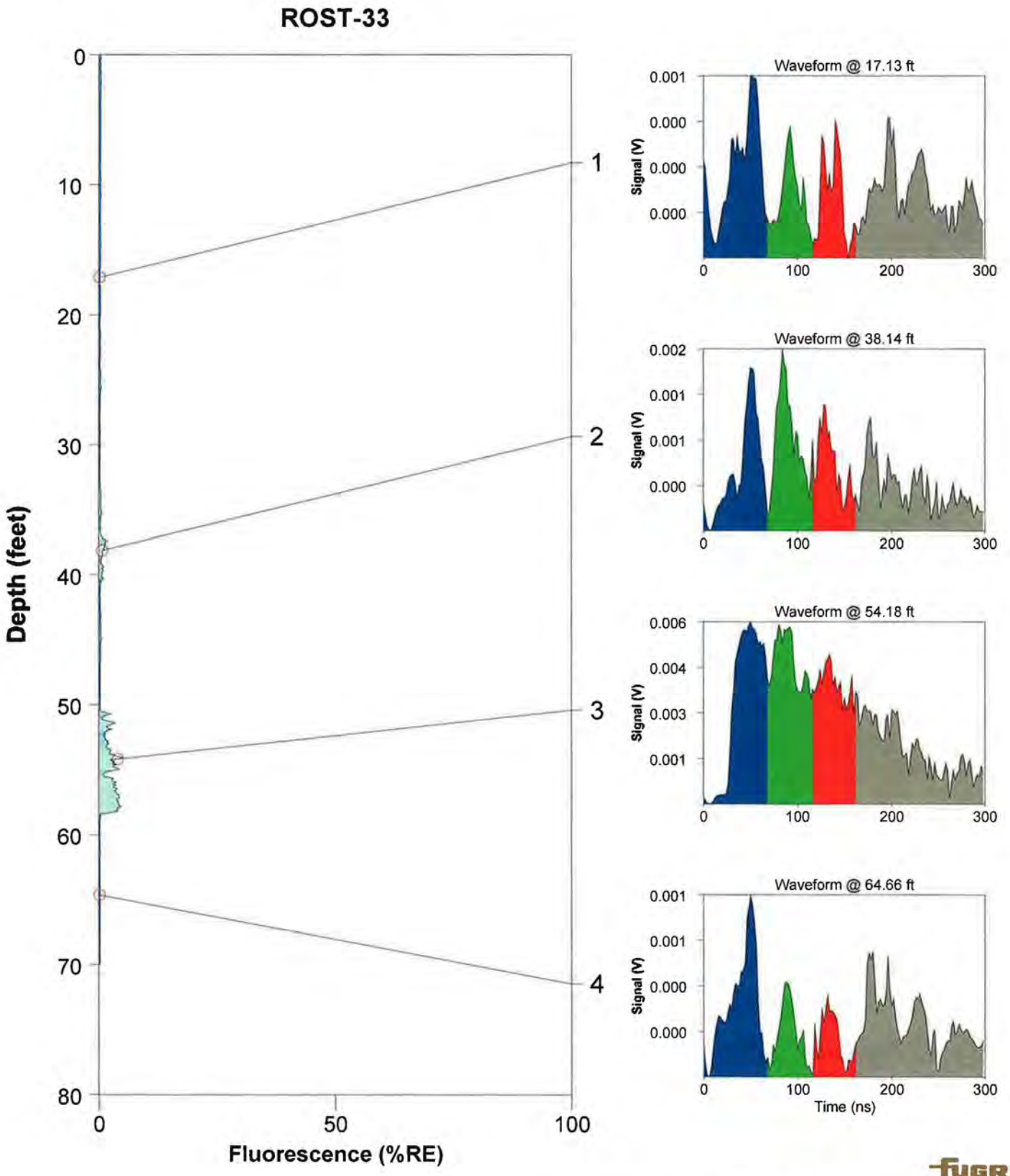
ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/9/2013 @ 8:36:20 AM	Max fluorescence: 4.95% @ 54.11 ft
ROST Unit: Houston	Final depth BGS: 70.04 ft



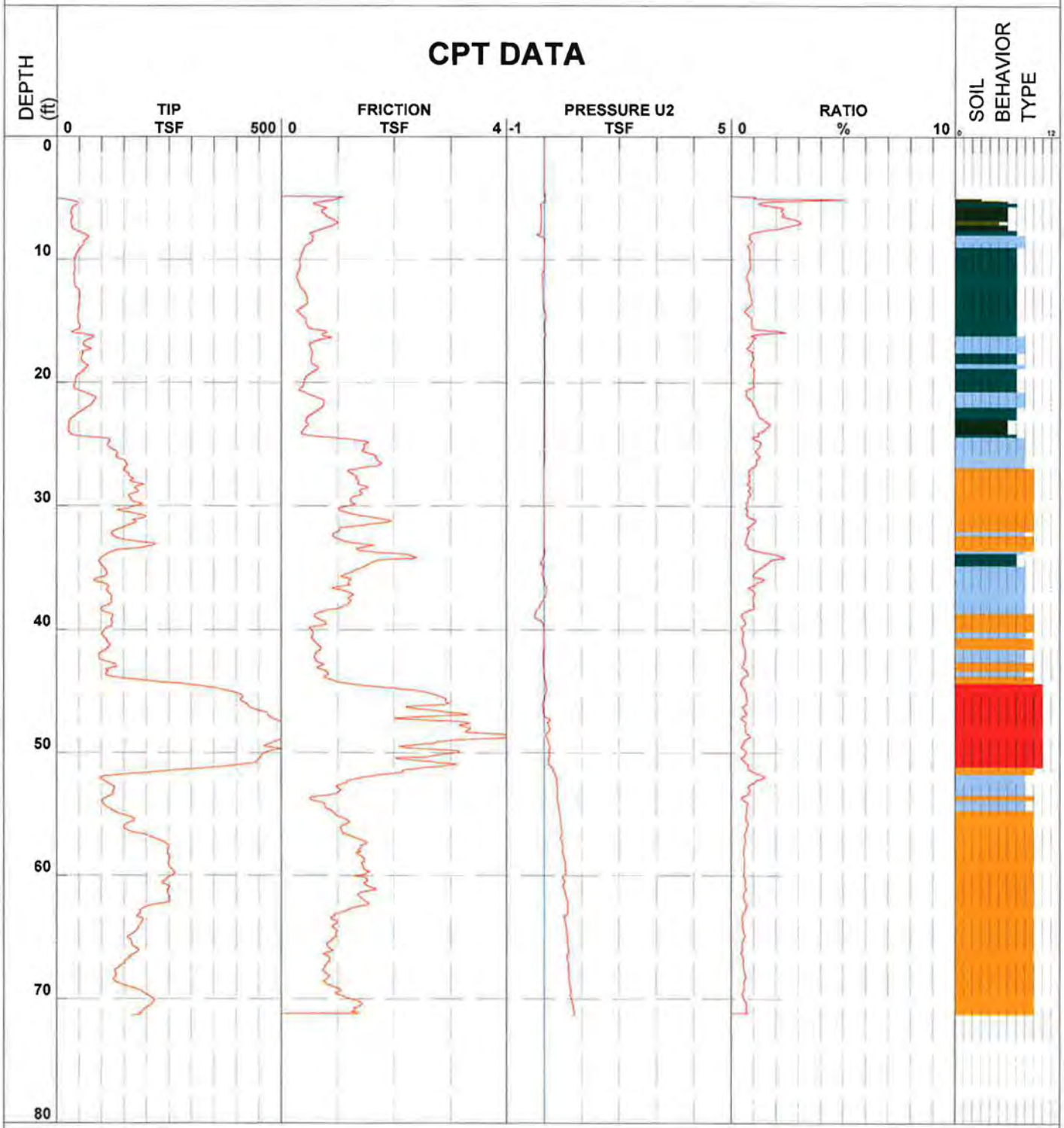
FUGRO

Job Number 04.1913-0025 CPT Number ROST-34 Location Roxana, Illinois

Operator Robert Biehle Date and T 08-May-2013 14:02:55 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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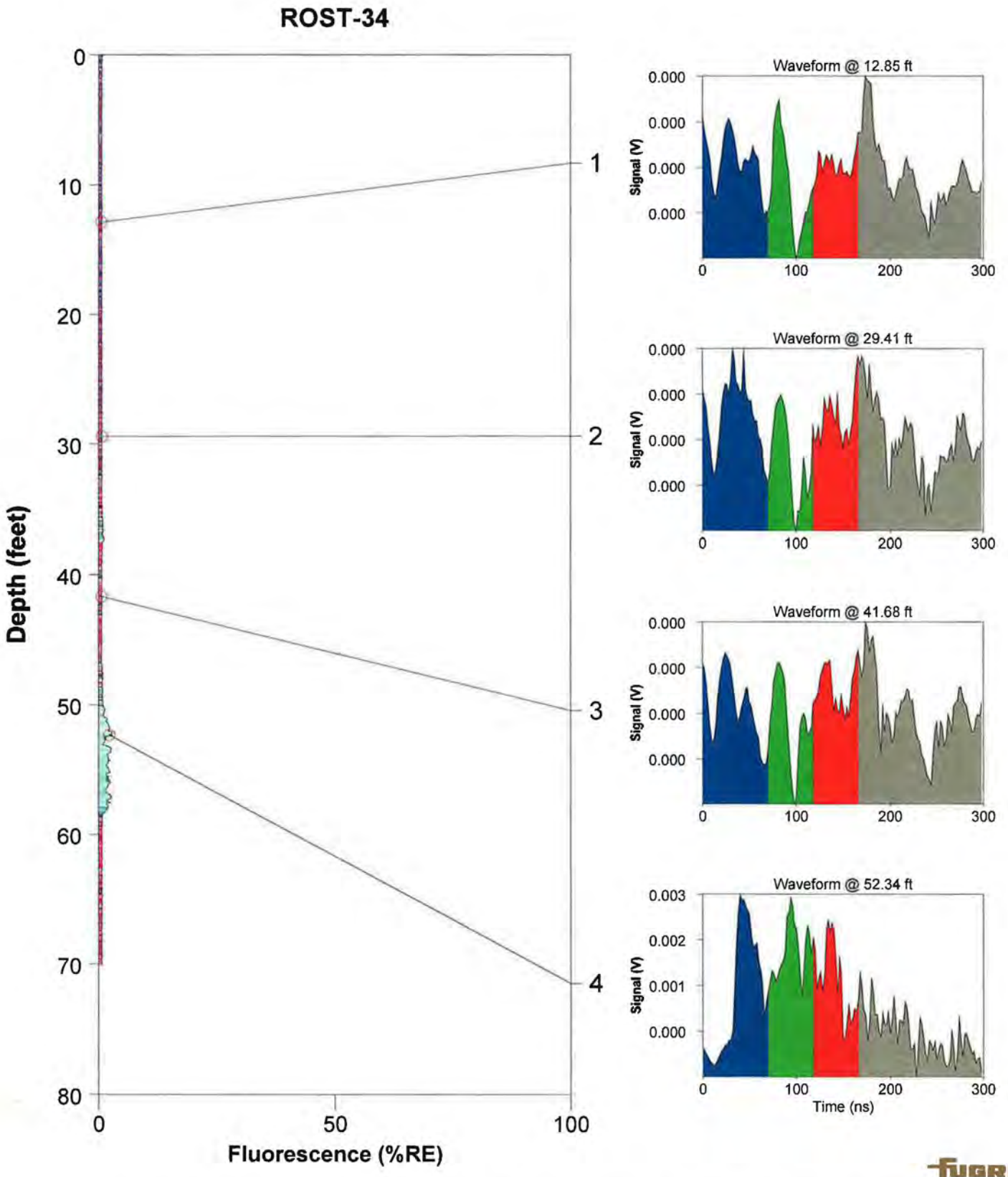
ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/8/2013 @ 2:16:05 PM	Max fluorescence: 3.00% @ 52.35 ft
ROST Unit: Houston	Final depth BGS: 70.08 ft



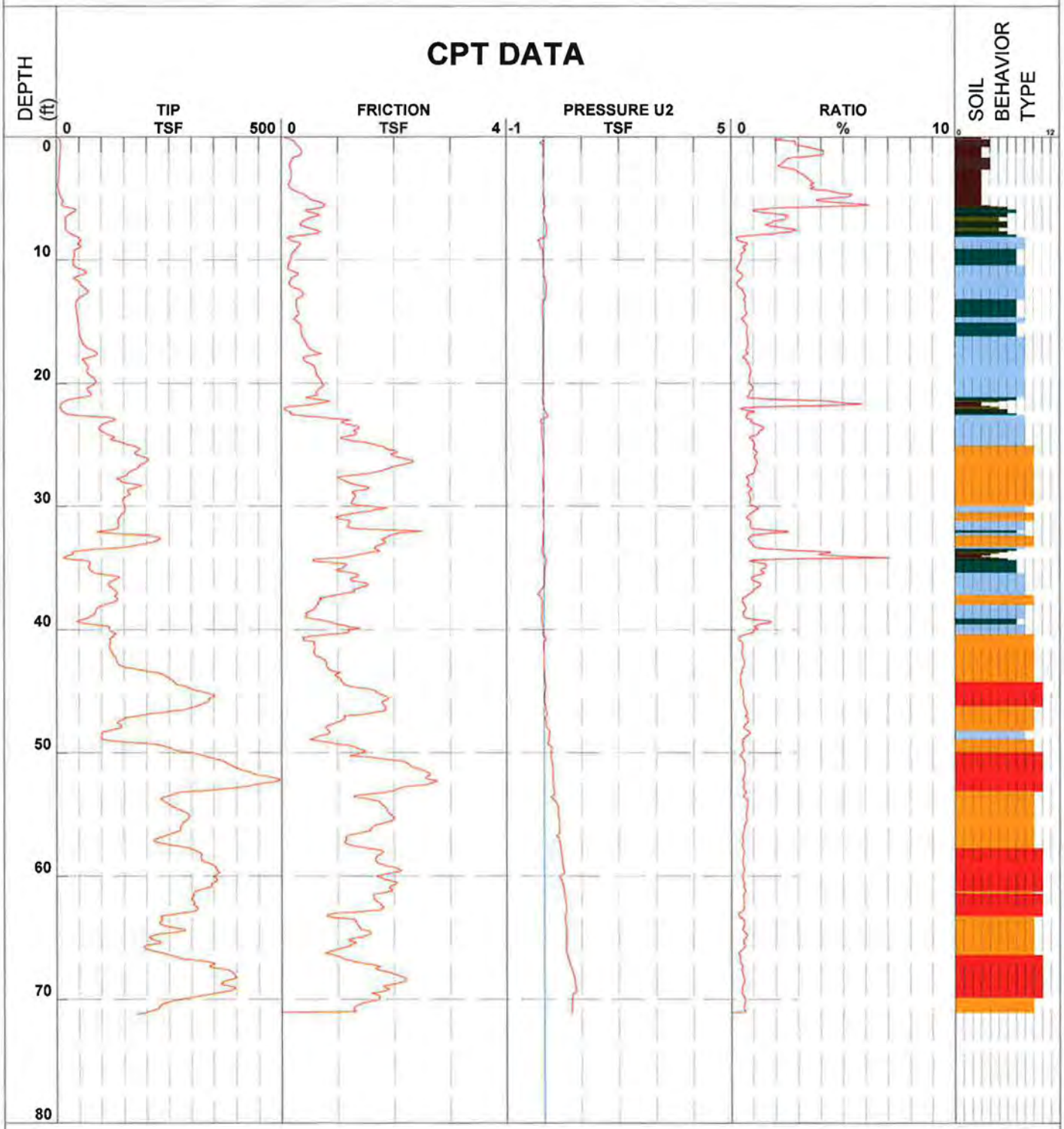
FUGRO

Job Number 04.1913-0025 CPT Number ROST-35 Location Roxana, Illinois

Operator Robert Biehle Date and T 08-May-2013 10:41:49 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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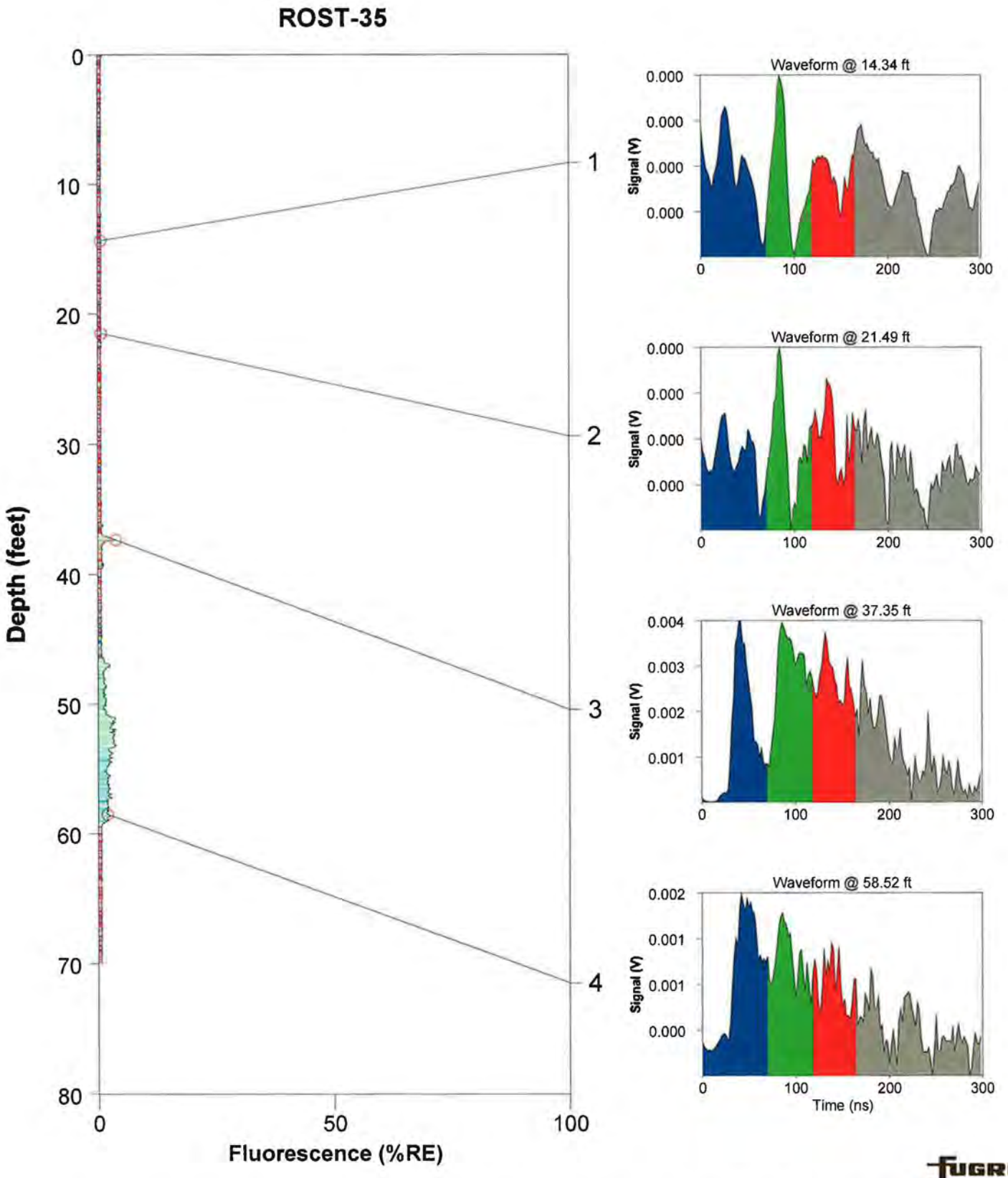
ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/8/2013 @ 10:40:00 AM	Max fluorescence: 3.86% @ 37.35 ft
ROST Unit: Houston	Final depth BGS: 70.01 ft

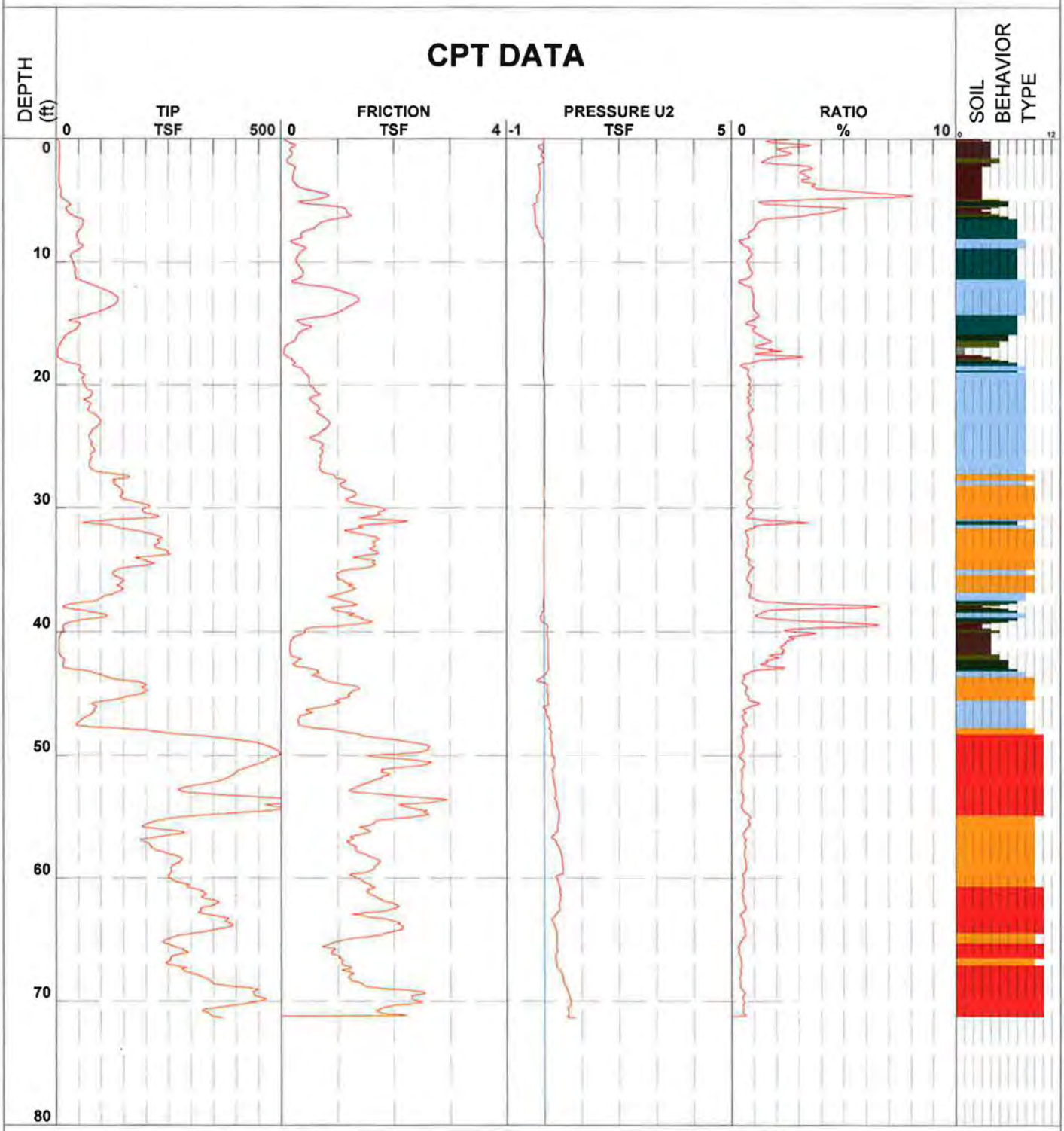


Job Number 04.1913-0025 CPT Number ROST-36 Location Roxana, Illinois

Operator Robert Biehle Date and T 08-May-2013 15:37:50 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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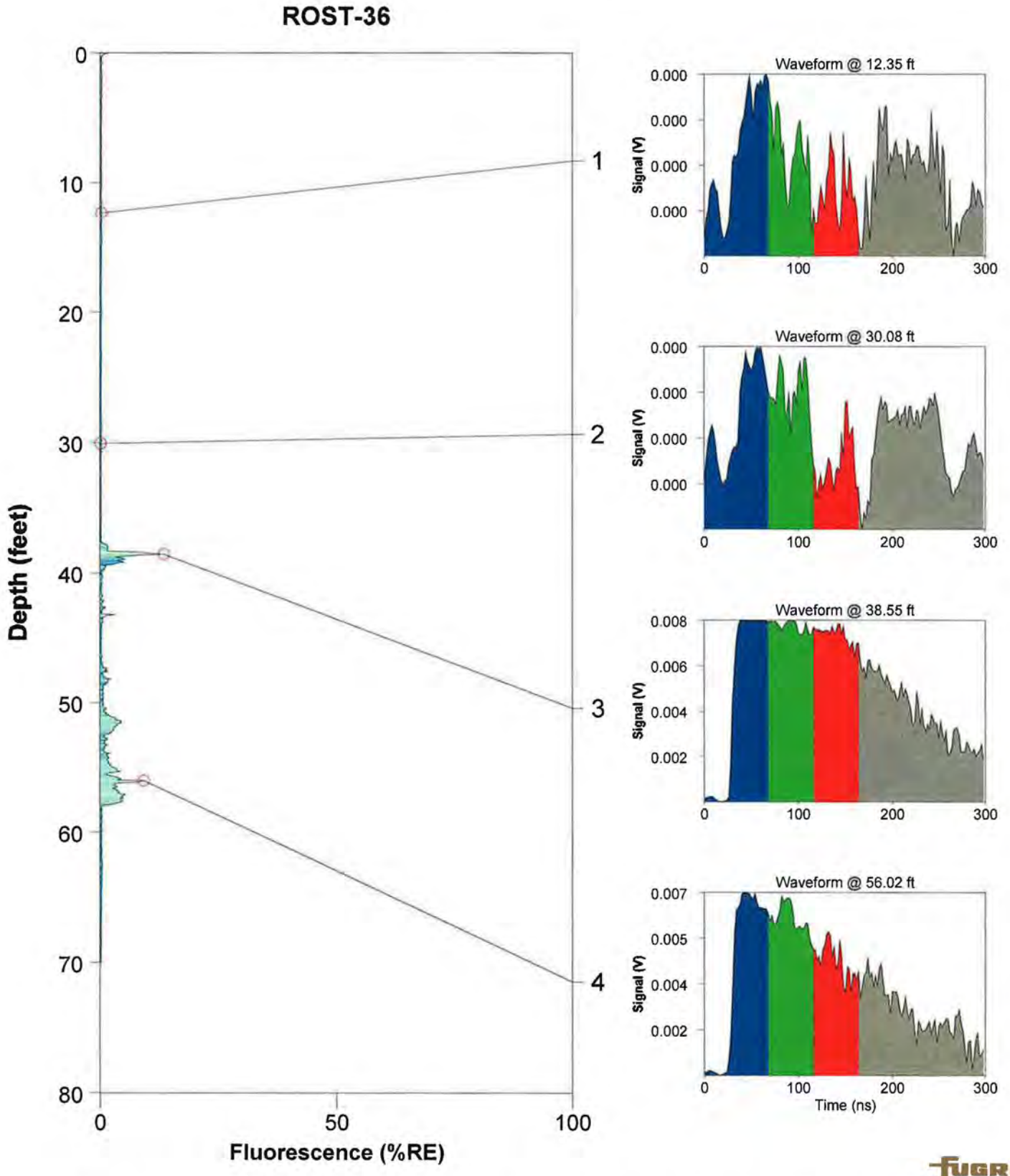
ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/8/2013 @ 3:56:35 PM	Max fluorescence: 13.58% @ 38.55 ft
ROST Unit: Houston	Final depth BGS: 70.03 ft

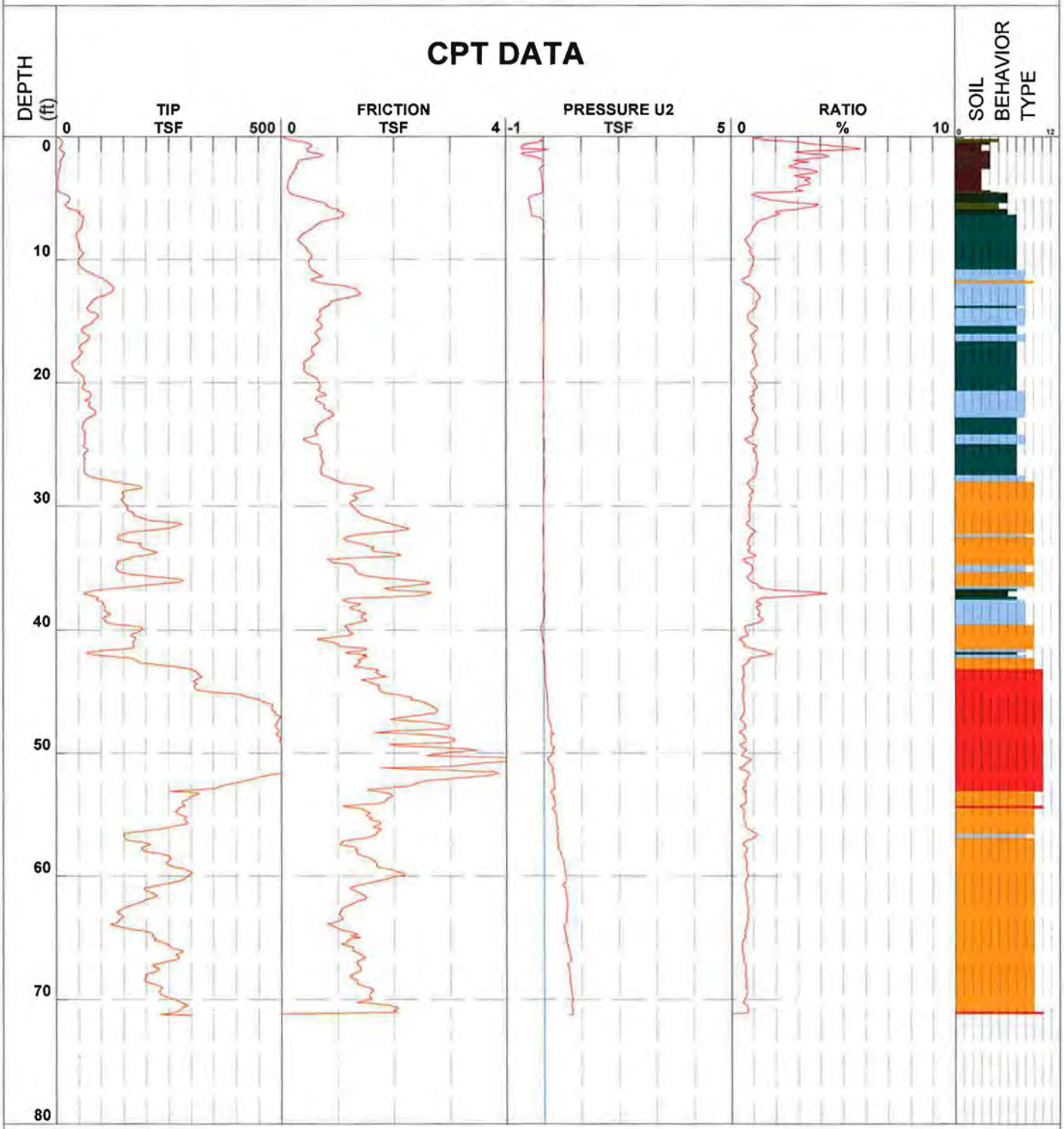


Job Number 04.1913-0025 CPT Number ROST-37 Location Roxana, Illinois

Operator Robert Biehle Date and T 08-May-2013 12:06:18 Cone Number F7.5CKE2HAW21165

Client URS Corporation

CPT DATA



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

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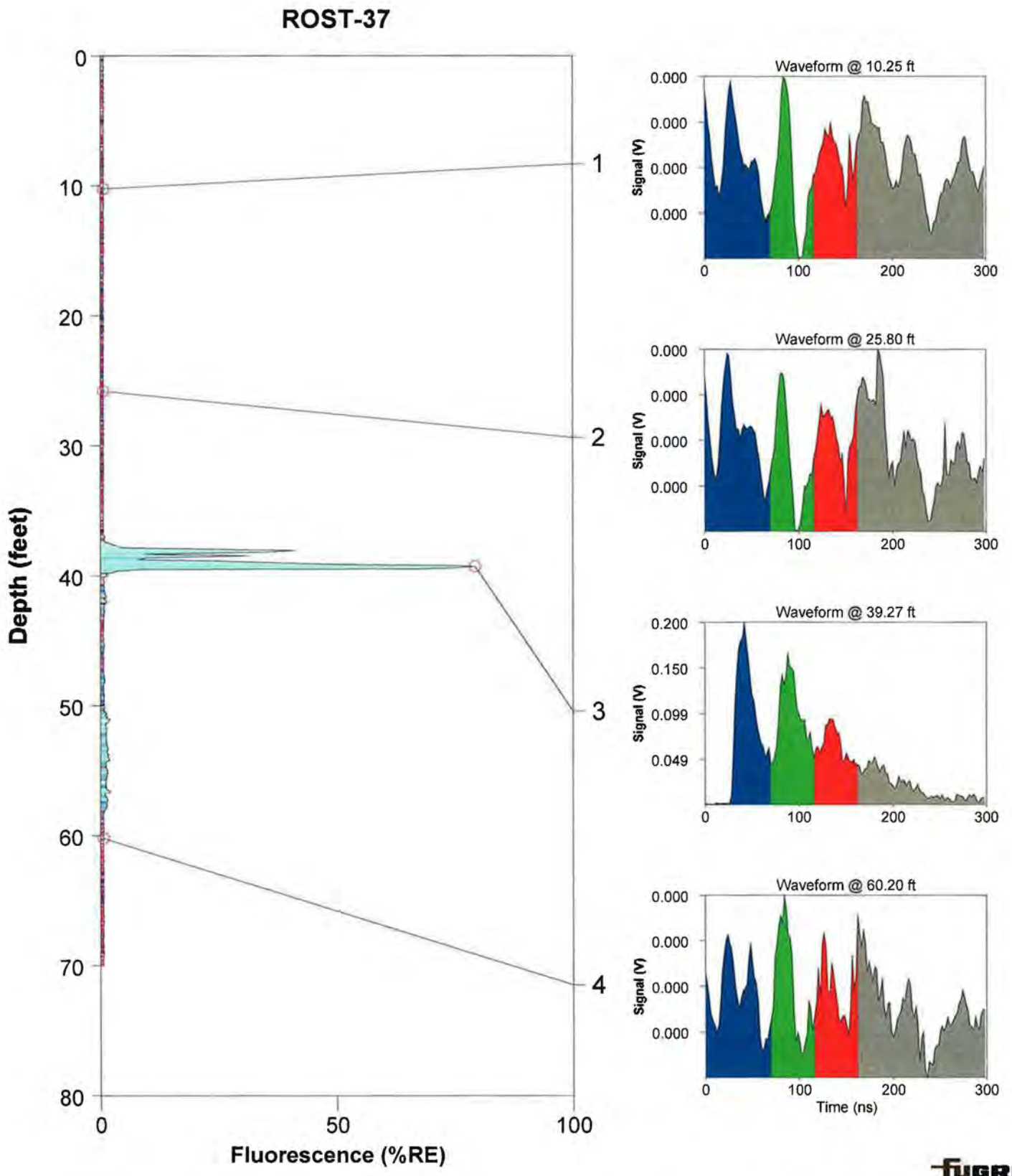
ROST Fluorescence Response Data

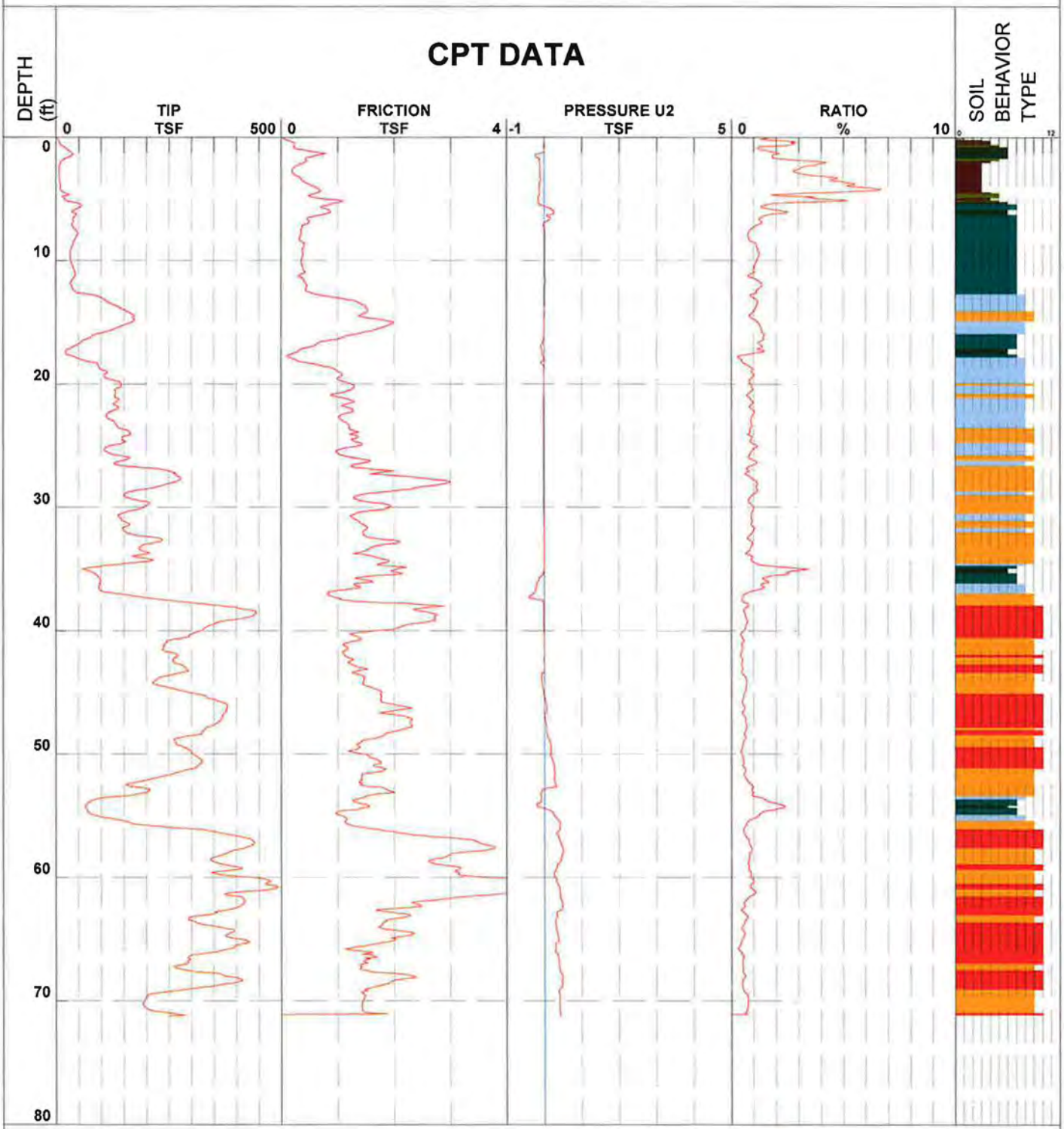
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/8/2013 @ 12:08:54 PM	Max fluorescence: 79.33% @ 39.27 ft
ROST Unit: Houston	Final depth BGS: 70.01 ft



Job Number 04.1913-0025 CPT Number ROST-38 Location Roxana, Illinois

Operator Robert Biehle Date and T 10-May-2013 08:24:59 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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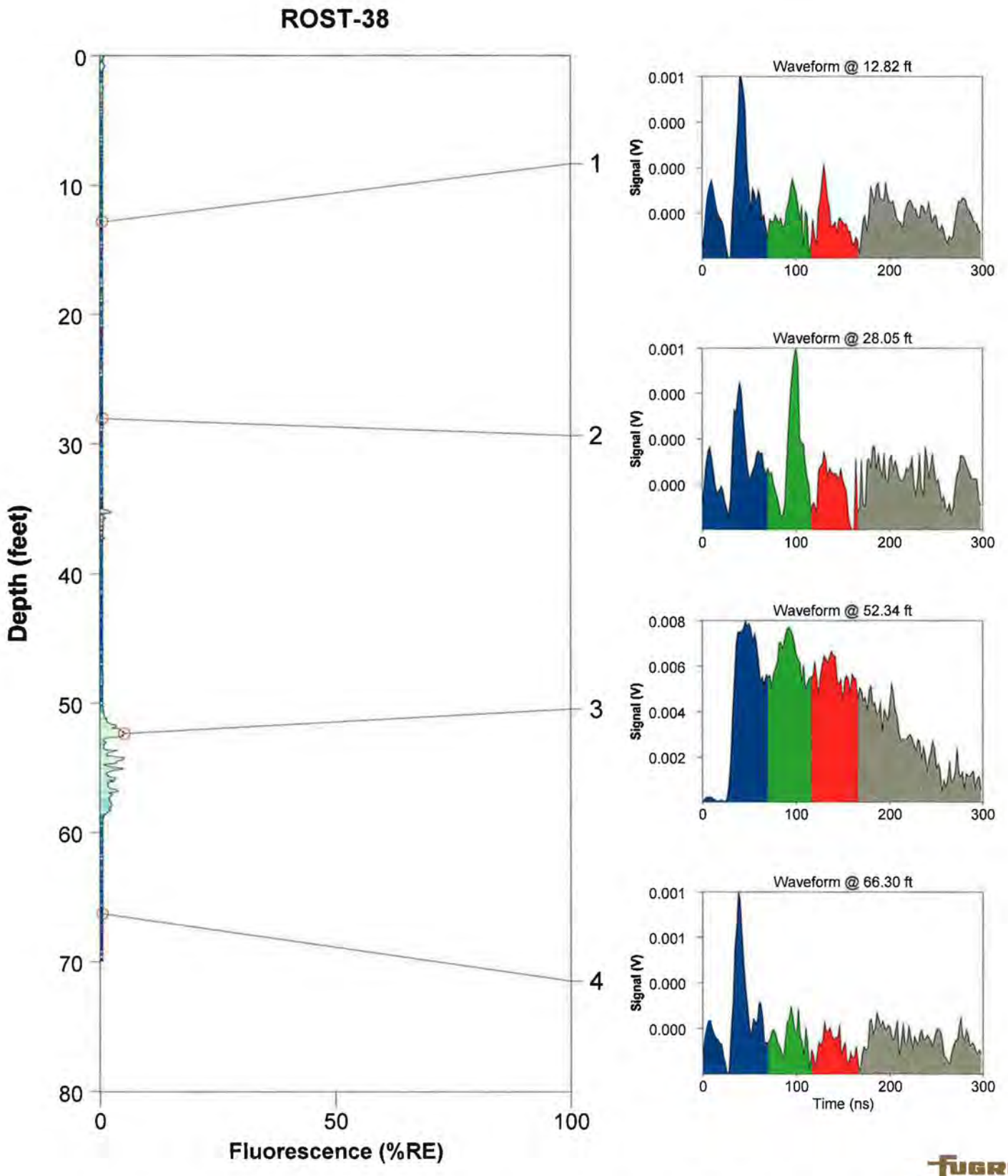
ROST Fluorescence Response Data

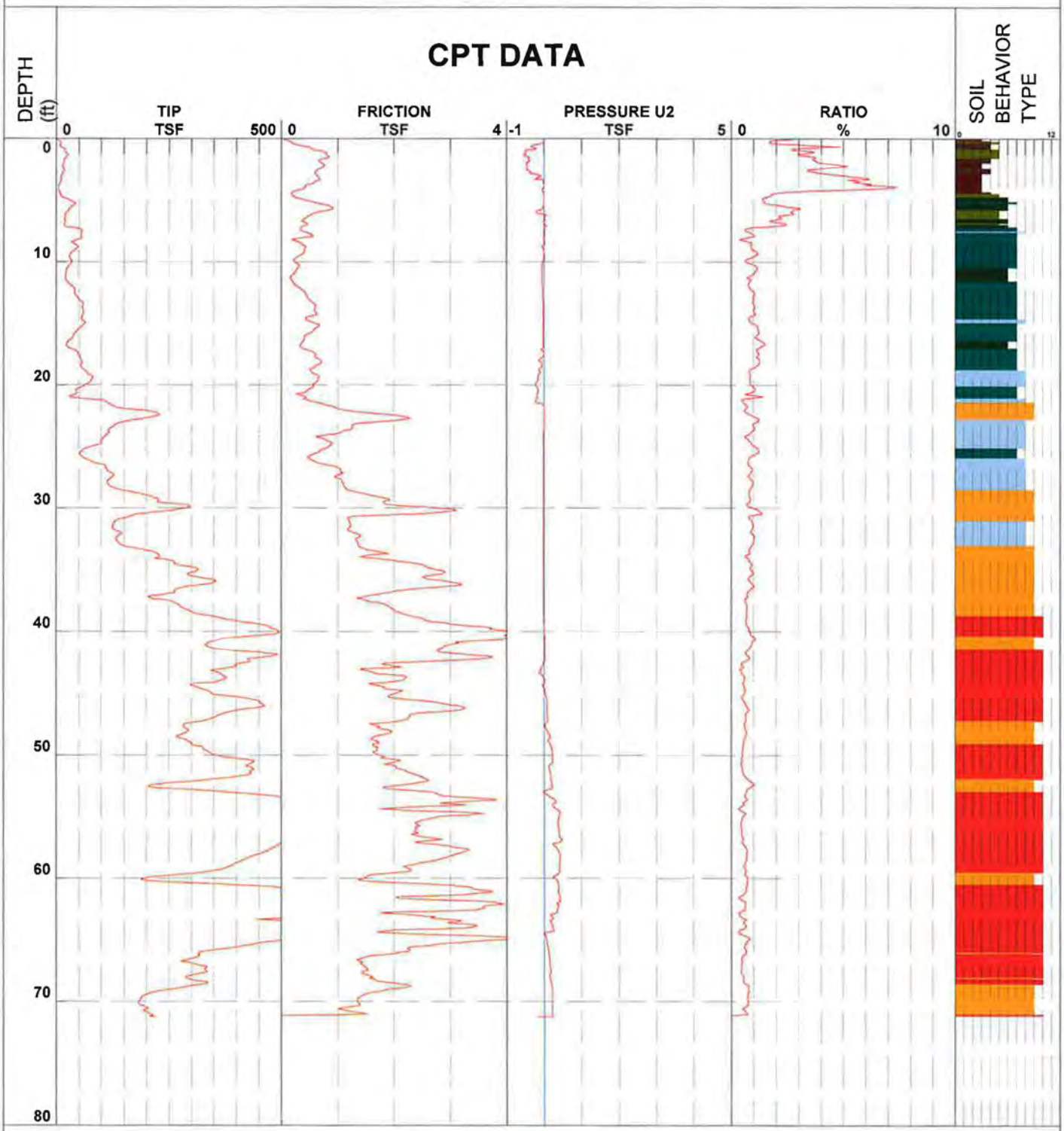
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/10/2013 @ 8:25:56 AM	Max fluorescence: 5.23% @ 52.34 ft
ROST Unit: Houston	Final depth BGS: 70.00 ft



Job Number 04.1913-0025 CPT Number ROST-39 Location Roxana, Illinois

Operator Robert Biehle Date and T 10-May-2013 09:42:33 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ▨ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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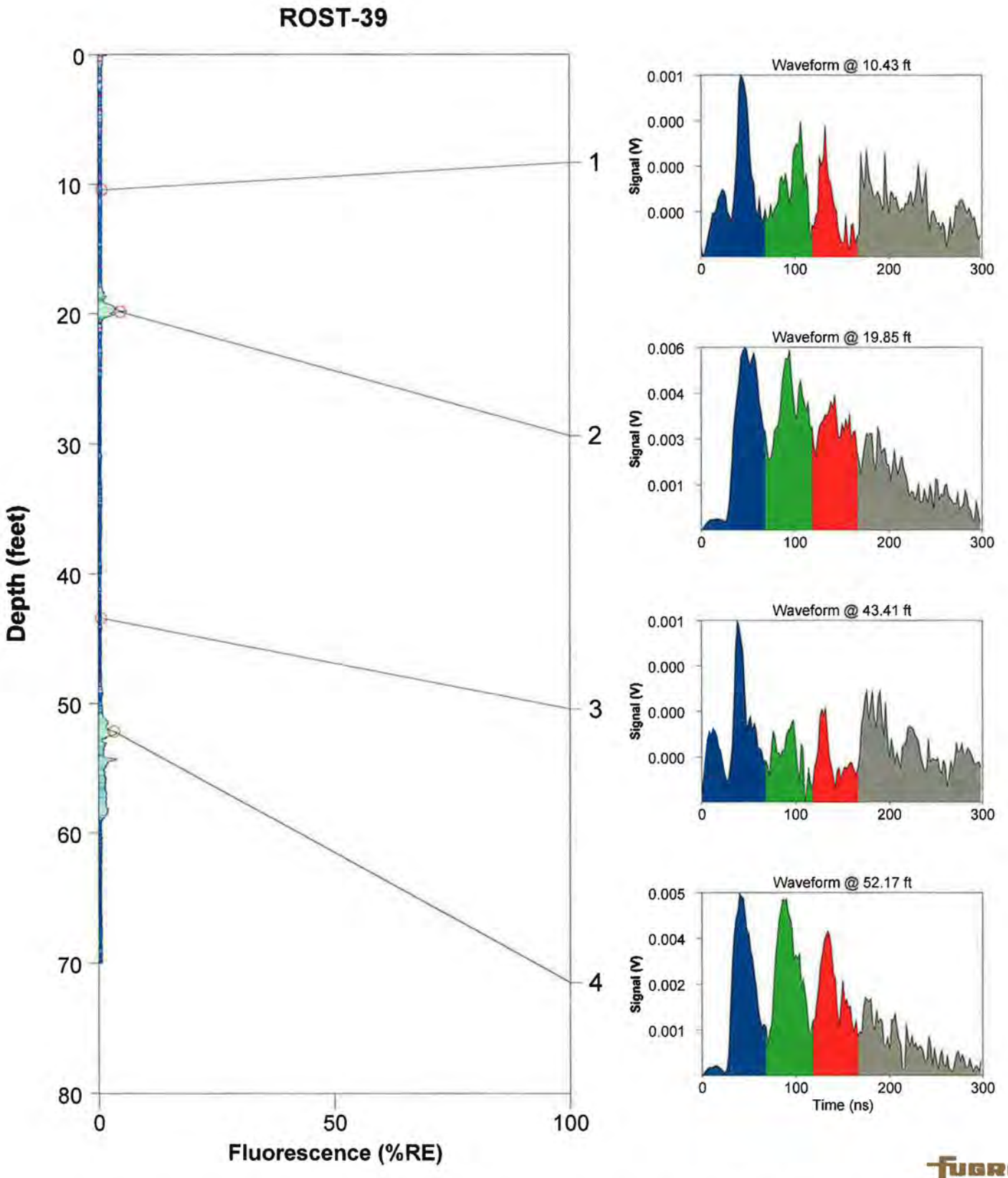
ROST Fluorescence Response Data

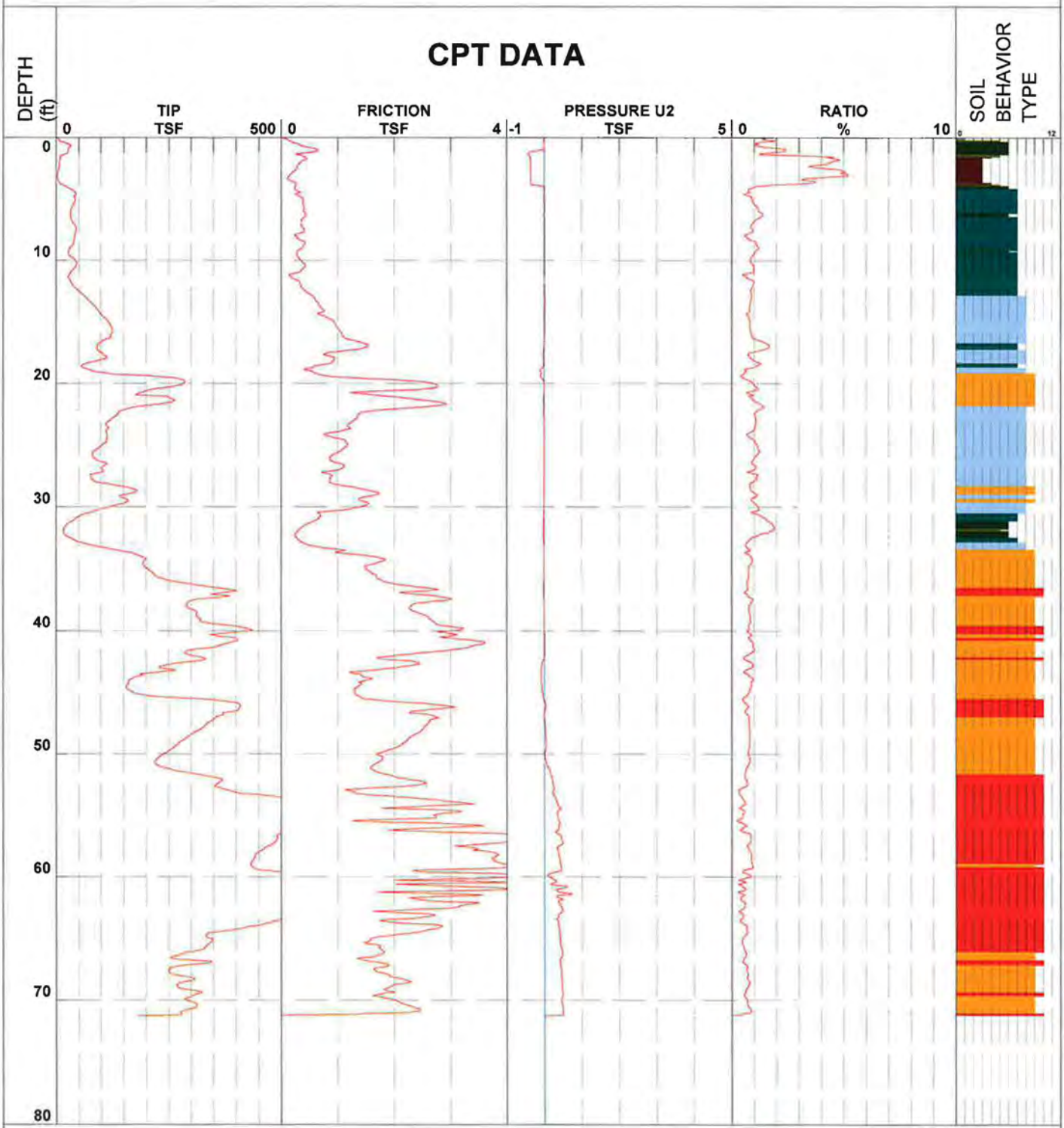
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/10/2013 @ 10:07:04 AM	Max fluorescence: 6.19% @ 19.82 ft
ROST Unit: Houston	Final depth BGS: 70.02 ft



Job Number 04.1913-0025 CPT Number ROST-40 Location Roxana, Illinois

Operator Robert Biehle Date and T 09-May-2013 14:43:51 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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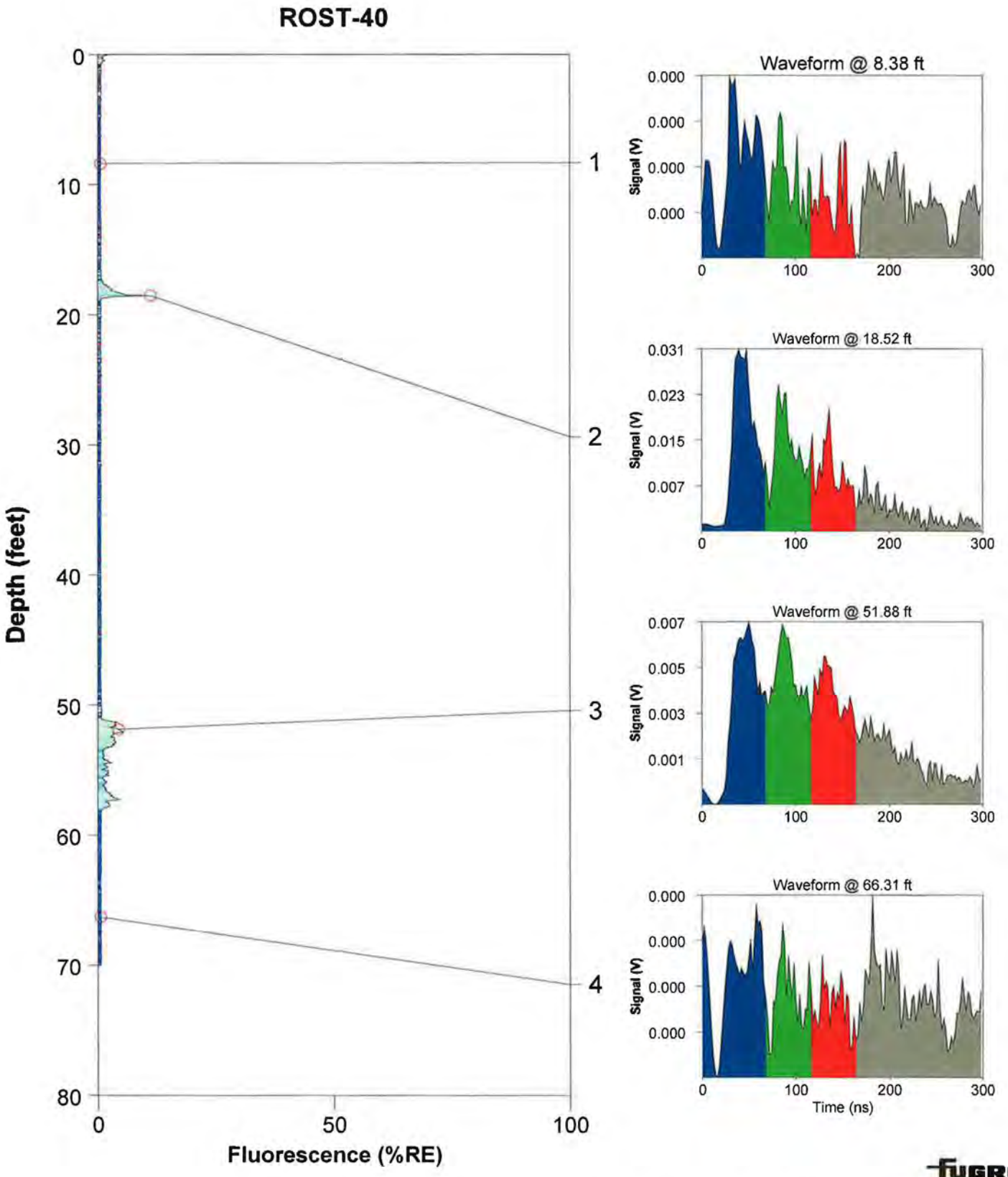
ROST Fluorescence Response Data

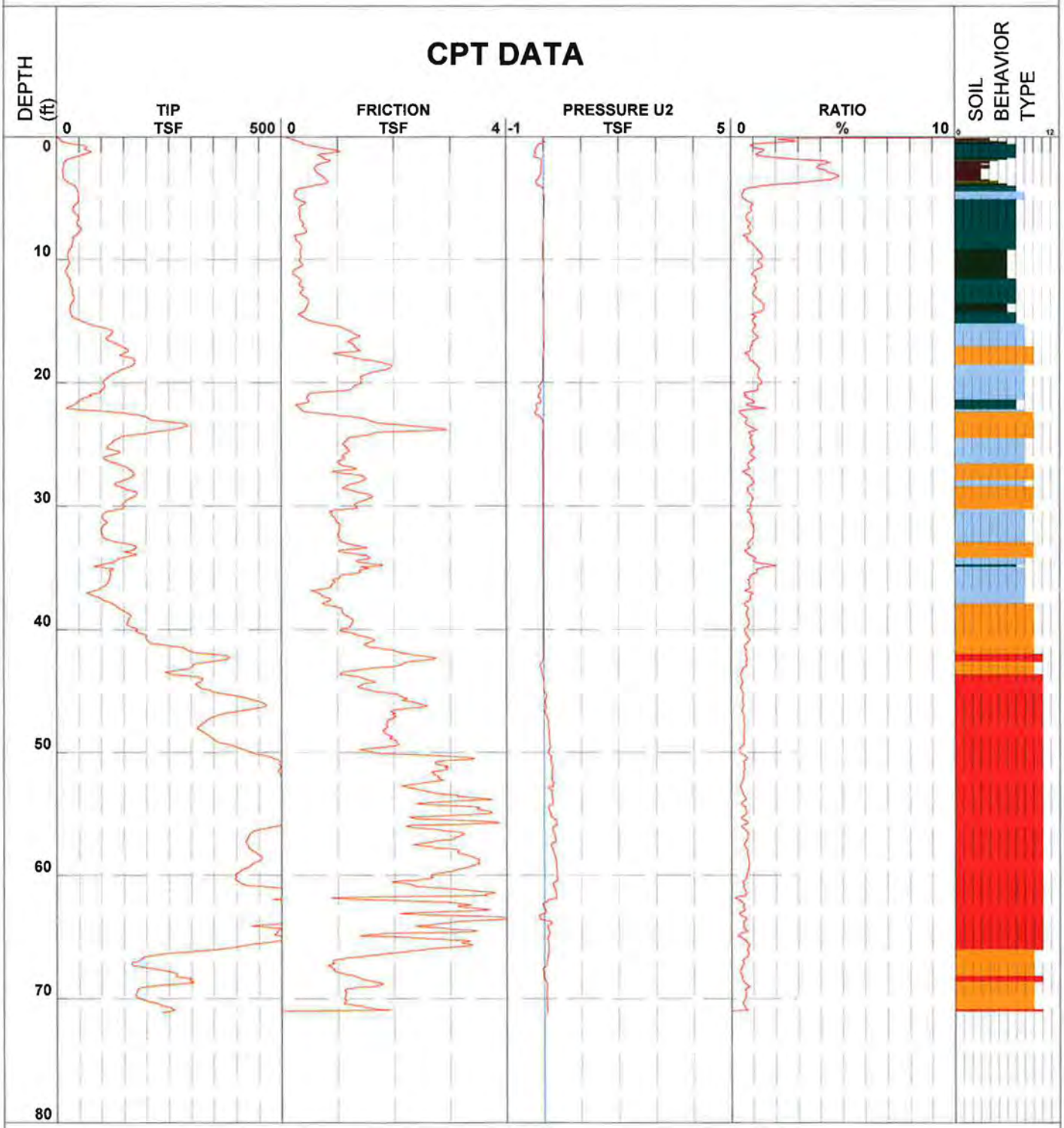
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/9/2013 @ 2:45:15 PM	Max fluorescence: 11.21% @ 18.52 ft
ROST Unit: Houston	Final depth BGS: 70.05 ft



Job Number 04.1913-0025 CPT Number ROST-41 Location Roxana, Illinois

Operator Robert Biehle Date and T 10-May-2013 11:30:17 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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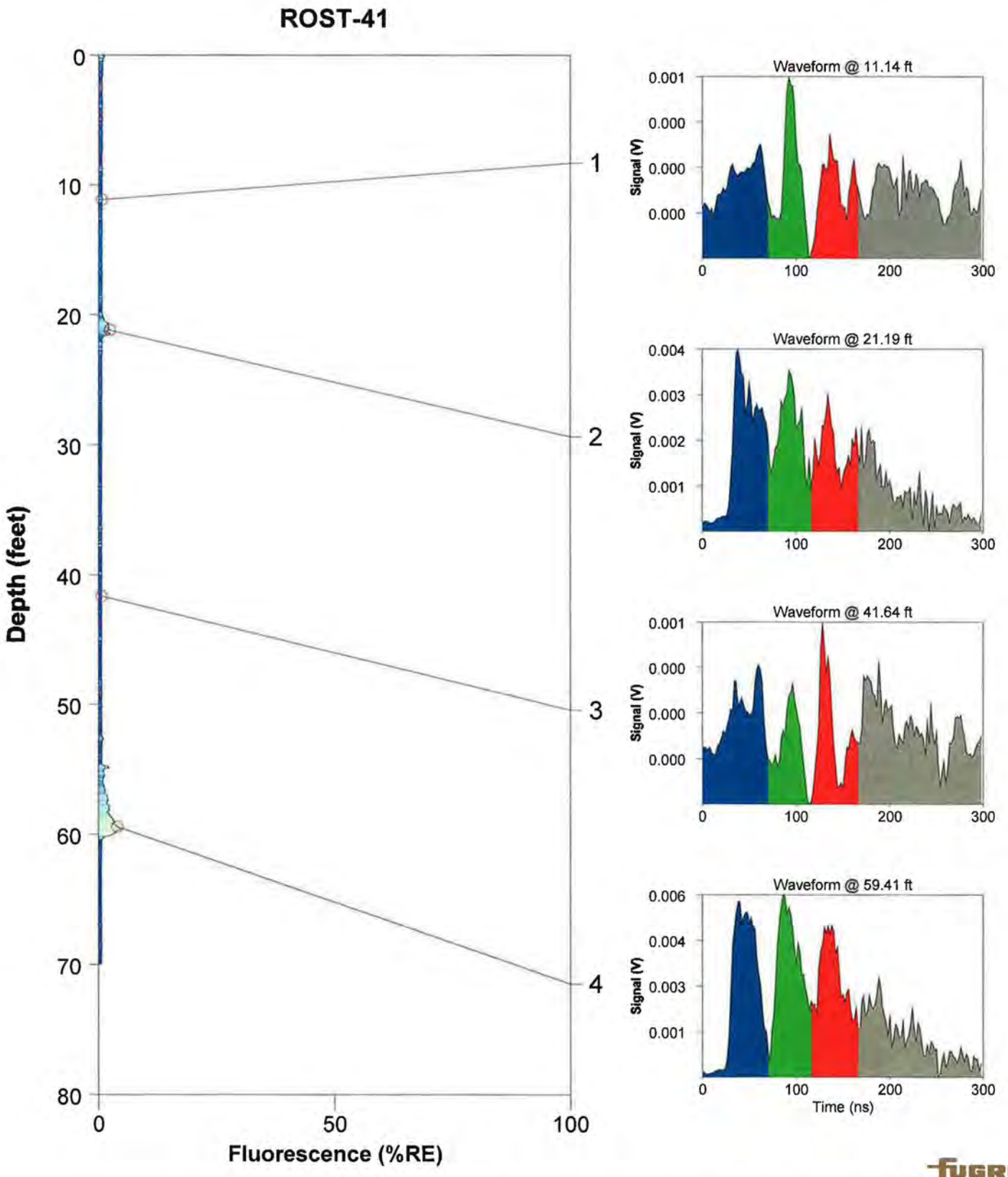
ROST Fluorescence Response Data

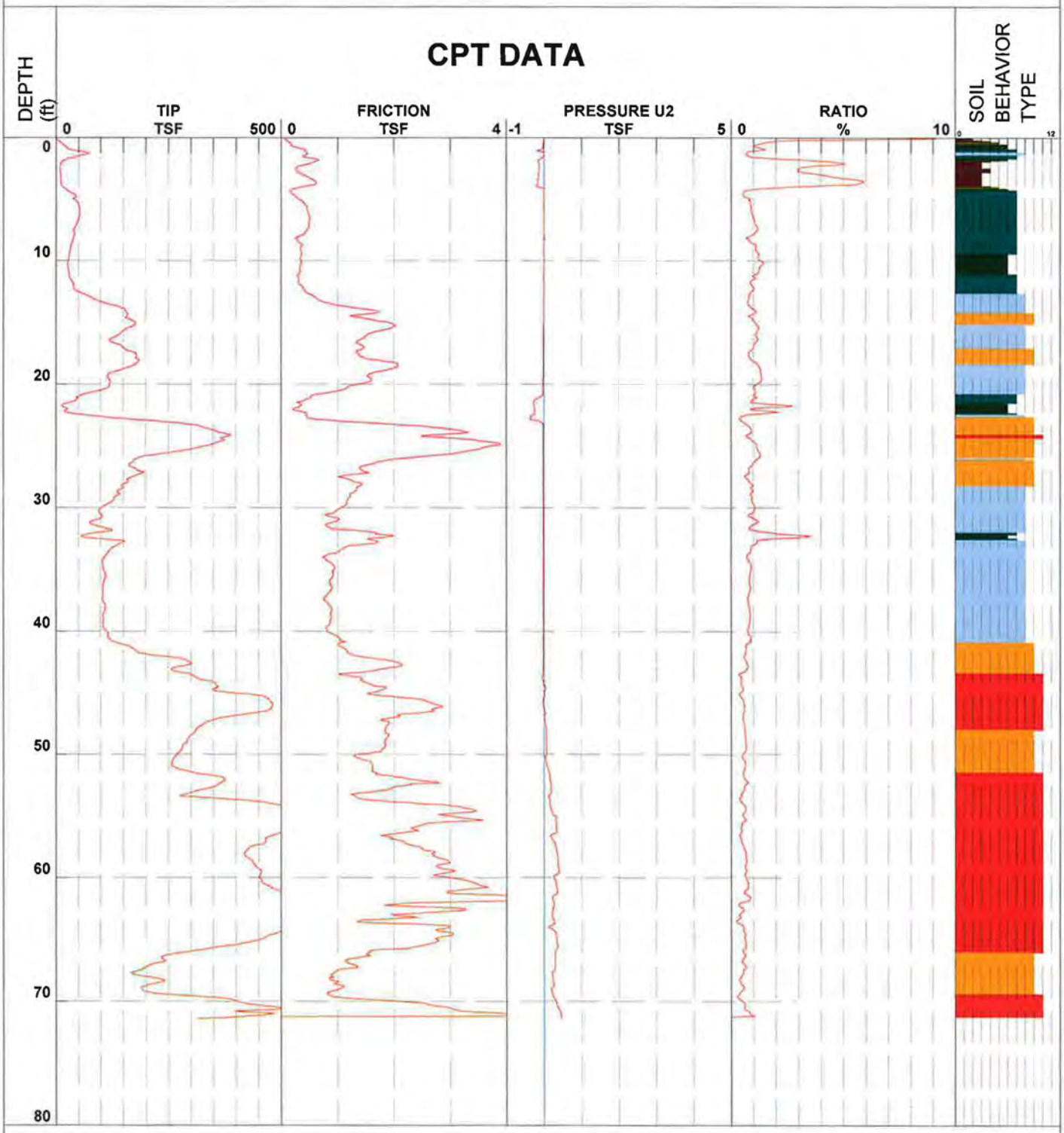
Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/10/2013 @ 11:35:26 AM	Max fluorescence: 4.92% @ 59.52 ft
ROST Unit: Houston	Final depth BGS: 70.00 ft



Job Number 04.1913-0025 CPT Number ROST-42 Location Roxana, Illinois

Operator Robert Biehle Date and T 09-May-2013 13:30:52 Cone Number F7.5CKE2HAW21165

Client URS Corporation



■ 1 - sensitive fine grained ■ 4 - silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand

■ 2 - organic material ■ 5 - clayey silt to silty clay ■ 8 - sand to silty sand ■ 11 - very stiff fine grained (*)

■ 3 - clay ■ 6 - sandy silt to clayey silt ■ 9 - sand ■ 12 - sand to clayey sand (*)

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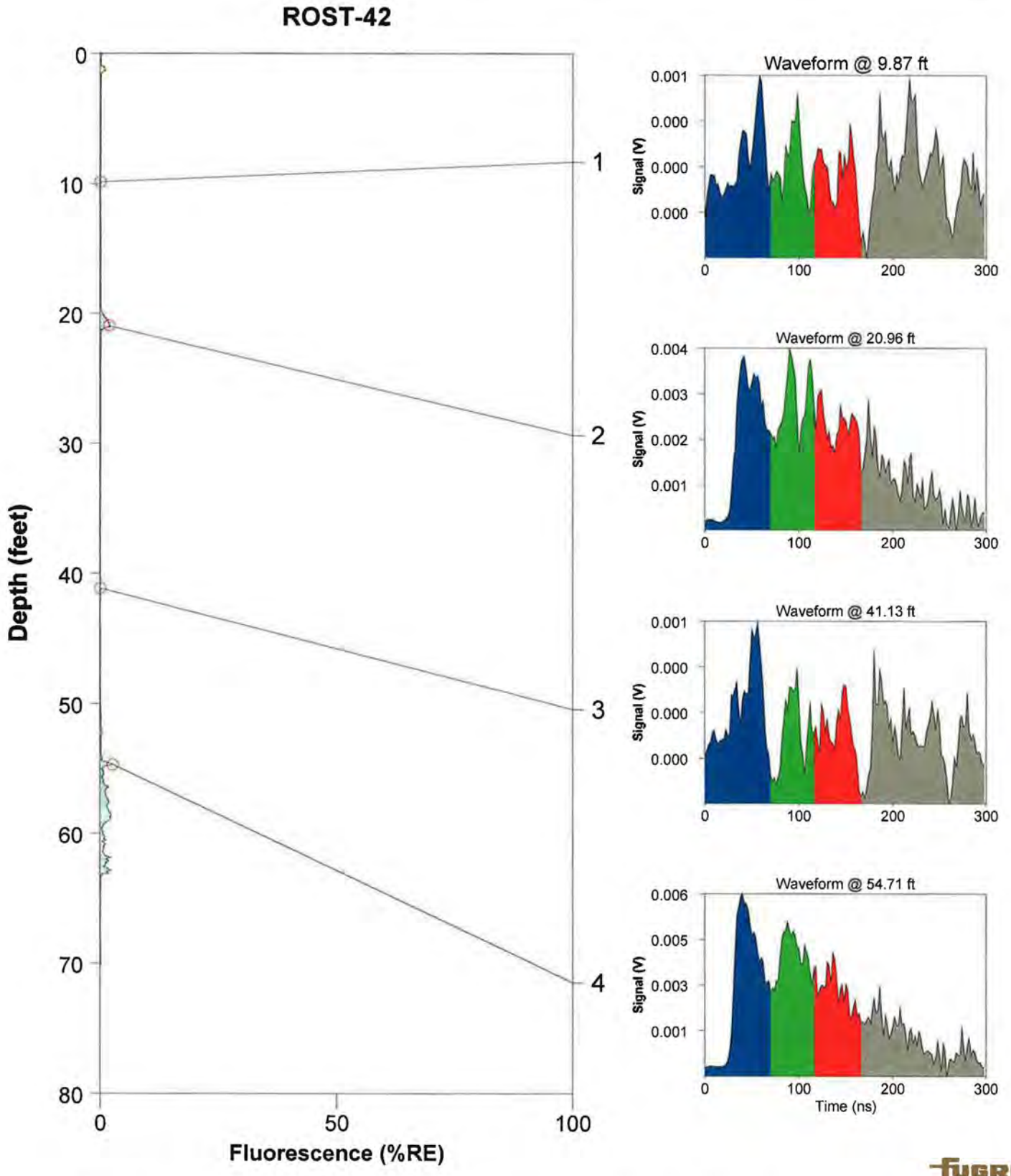
ROST Fluorescence Response Data

Site: Roxana, IL	Operator: Robert Biehle
Client: URS Corporation	Fugro Job #: 04.1913-0025
Date/Time: 5/9/2013 @ 1:30:41 PM	Max fluorescence: 2.76% @ 54.71 ft
ROST Unit: Houston	Final depth BGS: 70.20 ft



Appendix B
RTO Capacity Calculation
SVE System Expansion
Roxanna, Illinois

RTO Process Design Conditions	
Maximum RTO Flow (SCFM)	10,000
Process Flow (SCFM)	2,000
Maximum VOC Loading (PPMV Benzene)	10,000
Maximum RTO Loading - BTU/hr (assuming 17,500 BTU/lb for Benzene)	**4,400,000**

RTO Loading - BTU/hr

Header	Sample Date	BTU/CF	Monthly Average Vapor Flow SCFM	BTU/Hr	Combined BTU/Hr
WFL	1/3/2014	22	615	811,800	
PW	1/3/2014	29	244	424,560	1,236,360
WFL	2/7/2014	47	564	1,590,480	
PW	2/7/2014	42	236	594,720	2,185,200
WFL	3/4/2014	23	484	667,920	
PW	3/4/2014	48	190	547,200	1,215,120
WFL	4/1/2014	44	515	1,359,600	
PW	4/1/2014	35	274	575,400	1,935,000
			Average BTU/HR		**1,643,000**

Estimated Additional Loading from Expansion SVE wells - BTU/hr

New Wells	Vapor Flow SCFM	BTU/CF[1]	BTU/Hr	Combined BTU/Hr
SVE-42	10	110	66,000	
SVE-43	10	110	66,000	
SVE-44	10	110	66,000	
SVE-45	10	110	66,000	
SVE-46	10	110	66,000	
SVE-47	10	110	66,000	**396,000**
SVE-42	20	110	132,000	
SVE-43	20	110	132,000	
SVE-44	20	110	132,000	
SVE-45	20	110	132,000	
SVE-46	20	110	132,000	
SVE-47	20	110	132,000	**792,000**

Notes

[1] = Used lab data from sample collected from VMP-47 on 7/26/13 @ 14:00

Standard conditions are 1 atm and 68°F

Estimated Remaining RTO Loading Capacity - BTU/hr

Maximum RTO Design Loading	**4,400,000**
Current RTO Loading (4 month average)	**1,643,000**
Six SVE Expansion Wells @ 10 SCFM/well	
Estimated Additional Loading	396,000
Estimated Total RTO Loading	2,039,000
Estimated Remaining RTO Capacity	**2,361,000**
Six SVE Expansion Wells @ 20 SCFM/well	
Estimated Additional Loading	792,000
Estimated Total RTO Loading	2,435,000
Estimated Remaining RTO Capacity	**1,965,000**

Appendix B
Vacuum Loss Calculation
SVE System Expansion
Roxanna, Illinois

Vapor Flow Rate Per Well - Q (acfm)	10		
Conditions at Manifold			
	°C	K	°F
Temperature - T	26.06	299.22	78.9
	" H2O Vac	psi ABS	atm
Pressure - P	27.64	13.70	0.93
	Welded Steel	HDPE	
Roughness Coefficient - e (ft)	1.50E-04	5.00E-06	
Relative Roughness - e/D	3.72E-05	1.27E-06	
Dynamic Viscosity of air - μ (kg/m s)	1.81E-05	at T	

Segment	Component	Design Flow - Q (cfm)	Pipe Inside Diameter - D (inches)	Cross Sectional Area of Pipe - A (ft^2)	Air Flow Velocity - V (ft/min)	Approximate Pipe Length - L (ft)	Approximate No. of Fittings	Minor Loss Coefficient - K	Density of Air at expected T at P (kg/m3)	Reynolds Number - Re [1]	Friction Factor - f [2]	Combined Pressure Losses ΔP (in Hg) [3]	Combined Pressure Losses ΔP (in H2O)
Header Inlet at Manifold to SVE-12 Tee	Pipe	100	4.03	8.86E-02	1.13E+03	968			1.10	3.57E+04	2.26E-02	0.3657	5.0092
	Tee (flow through run)						1	0.2					
	90 Elbow						7	0.3					
	45 Elbow						8	0.2					
SVE-12 Tee to SVE-11 Tee	Pipe	90	4.03	8.86E-02	1.02E+03	126			1.10	3.21E+04	2.31E-02	0.03985	0.5459
	Tee (flow through run)						1	0.2					
	45 Elbow						2	0.2					
SVE-11 Tee to SVE-10 Tee	Pipe	80	4.03	8.86E-02	9.03E+02	113			1.10	2.85E+04	2.38E-02	0.02919	0.3998
	Tee (flow through run)						1	0.2					
	45 Elbow						2	0.2					
SVE-10 to HDPE Transition	Pipe	70	4.03	8.86E-02	7.90E+02	91			1.10	2.50E+04	2.45E-02	0.02144	0.2937
	Tee (flow through branch)						1	1					
	90 Elbow						2	0.3					
HDPE Transition to SVE-46/47 Tee	Pipe	70	3.938	8.46E-02	8.28E+02	57.5			1.10	2.56E+04	2.43E-02	0.01385	0.1897
	Tee (flow through run)						1	0.2					
	45 Elbow						2	0.2					
SVE-46/47 Tee to SVE-	Pipe	50	3.938	8.46E-02	5.91E+02	16			1.10	1.83E+04	2.64E-02	0.00260	0.0356
	Tee (flow through run)						1	0.2					
	90 Elbow						1	0.3					

Appendix B
Vacuum Loss Calculation
SVE System Expansion
Roxanna, Illinois

Segment	Component	Design Flow - Q (cfm)	Pipe Inside Diameter - D (inches)	Cross Sectional Area of Pipe - A (ft^2)	Air Flow Velocity - V (ft/min)	Approximate Pipe Length - L (ft)	Approximate No. of Fittings	Minor Loss Coefficient - K	Density of Air at expected T at P (kg/m3)	Reynolds Number - Re [1]	Friction Factor - f [2]	Combined Pressure Losses ΔP (in Hg) [3]	Combined Pressure Losses ΔP (in H2O)
SVE-3R Tee to SVE-45 Tee	Pipe	40	3.938	8.46E-02	4.73E+02	31			1.10	1.46E+04	2.80E-02	0.00302	0.0414
	Tee (flow through run)						2	0.2					
	45 Elbow						1	0.2					
SVE-45 Tee to SVE-44 Tee	Pipe	30	3.938	8.46E-02	3.55E+02	10			1.10	1.10E+04	3.02E-02	0.00069	0.0095
	Tee (flow through run)						1	0.2					
	45 Elbow						1	0.2					
SVE-44 Tee to SVE-42 Tee	Pipe	20	3.938	8.46E-02	2.36E+02	73			1.10	7.30E+03	3.38E-02	0.00203	0.0278
	Tee (flow through branch)						1	1					
	45 Elbow						1	0.2					
SVE-42 Tee to SVE-43	Pipe	10	3.938	8.46E-02	1.18E+02	45			1.10	3.65E+03	4.17E-02	0.00042	0.0057
	Ball Valve						1	0.05					
	Tee (flow through branch)						1	1					
	45 Elbow						2	0.2					
									Total Pressure Loss			**0.4756**	**6.5583**

[1] Reynolds Number: $Re = \rho * V * D / \mu$

[2] Friction Factor calculated using the relationship developed by Swamee and Jain: $f = 1.325 * (LN(0.27 * e/D + 5.74/Re^{0.9}))^{-2}$

Pressure Loss With SF = 25%	8.1979

[3] Combined Pressure Losses: ΔP = friction loss + minor losses

D'Arcy-Weisbach Equation: friction loss = $f * (L / D) * (\rho * V^2 / 2)$

minor loss = $K * V^2 / (2 * g)$

Estimated Vacuum at SVE-43	19.4421

File: P:\ENVIRONMENTAL\SHELL OIL PRODUCTS US 2014\3-ROXANA\06_SVE SYSTEM O&M\12-SVE EXTENSION\4TH STREET\CONCEPTUAL DESIGN\FIGURES\FIGURE C1 PROPOSED SVE PIPING NEAR 4TH AND CHAFFER STREETS.DWG Last edited: JUL. 31, 14 @ 4:11 p.m. by: david_deguire

LEGEND

- PROPOSED SVE WELL
- EXISTING SHALLOW SVE WELL
- EXISTING DEEP SVE WELL
- (441.97) GROUND SURFACE ELEVATION
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- PROPOSED SVE PIPING (UNDERGROUND)
- PROPERTY BOUNDARY
- EXISTING RED LINE
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)

Proposed SVE Well Coordinates/Elevations			
Well ID	Northing	Easting	Ground Elevation
SVE-42	793430	2322226	442.0976
SVE-43	793430.9	2322146	441.9665
SVE 44	793332.2	2322146	442.39
SVE-45	793339.9	2322208	442.4734
SVE 46	793260.3	2322210	442.5829
SVE 47	793164.6	2322212	443.8173
Coordinate information based on the Illinois State Plane Coordinate System - West Zone NAD83 (2007)			

NOTES:

1. TRENCH FOR INSTALLATION OF BELOW GRADE PIPING AND WELL VAULTS AT WELLS SVE-42 THROUGH SVE-47.
2. INSTALL BELOW GRADE STEEL WELL VAULTS AT SVE-42 THROUGH SVE-47.
3. FURNISH AND INSTALL 4 INCHES OF CLEAN SAND FILL FOR PIPE BEDDING
4. FURNISH AND INSTALL BELOW GRADE 4-INCH HDPE PIPE TO NEW SVE WELLS SVE-42 THROUGH SVE-47. ALL HDPE PIPE AND FITTINGS SHALL CONFORM TO ASTM D3350 AND F2619, PE3608/3408 RESIN WITH CELL CLASSIFICATION 345464C/E, AND ASTM F714 TYPE IPS. THE PIPE AND FITTINGS SHALL BE DR 17 (100 PSI WPR) UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS. PIPE SHALL BE INSTALLED AT A MINIMUM DEPTH OF 30-INCHES BELOW GRADE WITH A MINIMUM SLOPE OF 1/4" IN 10'. PIPING INVERT ELEVATIONS ARE PROVIDED ON THE SITE PLAN. DIRECTION ARROWS SHOWN ON THE SITE PLAN INDICATE THE SLOPE DIRECTION OF THE PIPING.
5. ALL GASKETS WILL BE OF VITON® MATERIAL.
6. PERFORM PRESSURE TESTING OF ALL PIPING INSTALLATIONS.
7. WITHIN THE EAST FOURTH STREET RIGHT OF WAY, BACKFILL PIPE TRENCH WITH CLEAN SAND FILL TO 6 INCHES ABOVE TOP OF PIPE, AND THEN FLOWABLE FILL TO 4 INCHES BELOW EXISTING GRADE.
8. ON THE SOPUS-OWNED PARCELS, BACKFILL PIPE TRENCH WITH CLEAN SAND FILL TO 6 INCHES ABOVE TOP OF PIPE, AND THEN EXCAVATED NATIVE MATERIAL TO GRADE. BACKFILL WELL VAULT EXCAVATIONS WITH FLOWABLE FILL TO 12 INCHES BELOW GRADE AND PLACE CONCRETE PAD AROUND VAULT.
9. ASPHALT PAVEMENT AND CONCRETE SIDEWALK AND CURB AND GUTTER WILL BE REPLACED TO MATCH EXISTING.
10. THE HOT ASPHALT CONCRETE PAVEMENT SHALL CONSIST OF AN AGGREGATE OR ASPHALT BASE COURSE AND ASPHALT SURFACE COURSE CONSTRUCTED IN CONFORMITY WITH THE LINES, GRADES, THICKNESS, AND CROSS SECTIONS SHOWN IN THE DRAWINGS. ASPHALTIC BASE AND ASPHALT CONCRETE MATERIALS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS AND OTHER APPROPRIATE SECTIONS OF THE LATEST VERSION OF THE STATE HIGHWAY MATERIAL SPECIFICATIONS, INCLUDING AMENDMENTS, ADDENDA AND ERRATA. SUB-BASE AGGREGATE (WHERE REQUIRED) MAXIMUM SIZE 1-1/2". ASPHALTIC BASE COURSE MAXIMUM SIZE 1". ASPHALTS SHALL COMPLY WITH PROVISIONS BELOW.
    a. ASPHALT CEMENT: PENETRATION GRADE 50/60
    b. PRIME COAT: CUT-BACK TYPE, GRADE MC-250
    c. TACK COAT: UNIFORMLY EMULSIFIED, GRADE SS-1H

    SEALER SHALL CONSIST OF SUITABLE FIBRATED CHEMICAL TYPE ASPHALT BASE BINDERS AND FILLERS HAVING A CONTAINER CONSISTENCY SUITABLE FOR TROWELING AFTER THOROUGH STIRRING, AND CONTAINING NO CLAY OR OTHER DELETERIOUS SUBSTANCE.

    PROVIDE HOT PLANT-MIXED ASPHALTIC CONCRETE PAVING MATERIALS.

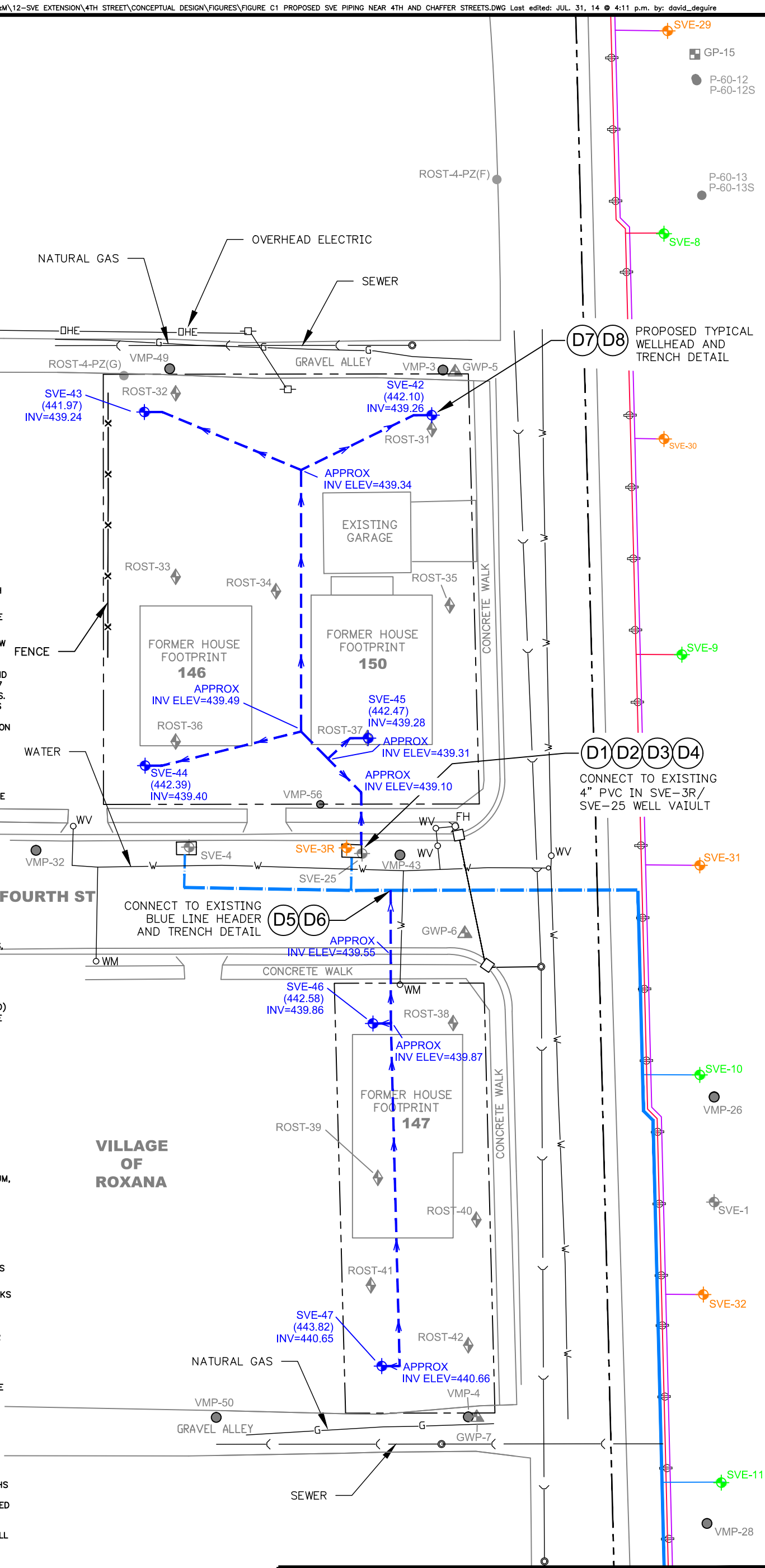
    a. TEMPERATURE LEAVING THE PLANT: 290 DEGREES F MINIMUM, 320 DEGREES F MAXIMUM.
    b. TEMPERATURE AT TIME OF PLACING: 280 DEGREES F MINIMUM.

    ROLLING:

    a. AFTER THE MATERIAL HAS BEEN SPREAD TO THE PROPER DEPTH, ROLL UNTIL THE SURFACE IS HARD, SMOOTH, UNYIELDING, AND TRUE TO THE THICKNESS AND ELEVATIONS SHOWN OWN THE DRAWINGS.
    b. ROLL IN AT LEAST TWO DIRECTIONS UNTIL NO ROLLER MARKS ARE VISIBLE.
    c. FINISHED PAVING SMOOTHNESS TOLERANCE:
        1. NO DEPRESSIONS WHICH WILL RETAIN STANDING WATER
        2. NO DEVIATION GREATER THAN 1/8"IN SIX FEET.

    APPLY ONE COAT OF THE SPECIFIED SEALER.

    REMOVE ALL DEBRIS, RUBBISH, AND EXCESS MATERIAL FROM THE WORK AREA.
11. CAST IN PLACE CONCRETE ADMIXTURE CONTENT, BATCHING METHOD, AND TIME OF INTRODUCTION TO THE MIX SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. A WATER-REDUCING ADMIXTURE AND AN AIR-ENTRAINING ADMIXTURE SHALL BE INCLUDED IN ALL CONCRETE. NO CALCIUM CHLORIDE OR ADMIXTURE CONTAINING CHLORIDE FROM OTHER THAN IMPURITIES FROM ADMIXTURE INGREDIENTS WILL BE ACCEPTABLE. THE MINIMUM ACCEPTABLE COMPRESSIVE STRENGTHS SHALL BE 3,000 PSI AT 7 DAYS AND 4,000 PSI AT 28 DAYS. CONCRETE SHALL BE FURNISHED BY AN ACCEPTABLE READY MIXED CONCRETE SUPPLIER AND SHALL CONFORM TO ASTM C94. SLUMP SHALL NOT EXCEED 4 INCHES. FORM TIES SHALL BE OF THE REMOVABLE END, PERMANENTLY EMBEDDED BODY TYPE, AND SHALL HAVE SUFFICIENT STRENGTH AND RIGIDITY TO SUPPORT AND MAINTAIN THE FORM IN PROPER POSITION AND ALIGNMENT WITHOUT THE USE OF AUXILIARY SPREADERS. CHAMFER STRIPS SHALL BE PLACED IN FORMS TO BEVEL ALL SALIENT EDGES AND CORNERS, EXCEPT THE TOP EDGES OF WALLS AND SLABS WHICH ARE TO BE TOOLED AND EDGES WHICH ARE TO BE BURIED. UNLESS OTHERWISE NOTED, BEVELS SHALL BE 3/4 INCH WIDE. FORMS SHALL NOT BE REMOVED OR DISTURBED UNTIL THE CONCRETE HAS ATTAINED SUFFICIENT STRENGTH TO SAFELY SUPPORT ALL DEAD, LIVE, AND CONSTRUCTION LOADS. CARE SHALL BE TAKEN IN FORM REMOVAL TO AVOID SURFACE GOUGING, CORNER OR EDGE BREAKAGE, AND OTHER DAMAGE TO THE CONCRETE.



SHELL OIL PRODUCTS US ROXANA, ILLINOIS		PROJECT NO. 21562973
URS		
DRN. BY: djd May 2014 DSGN. BY: ef CHKD. BY: ef	Proposed SVE Piping Near 4th & Chaffer Streets	FIG. NO. C1

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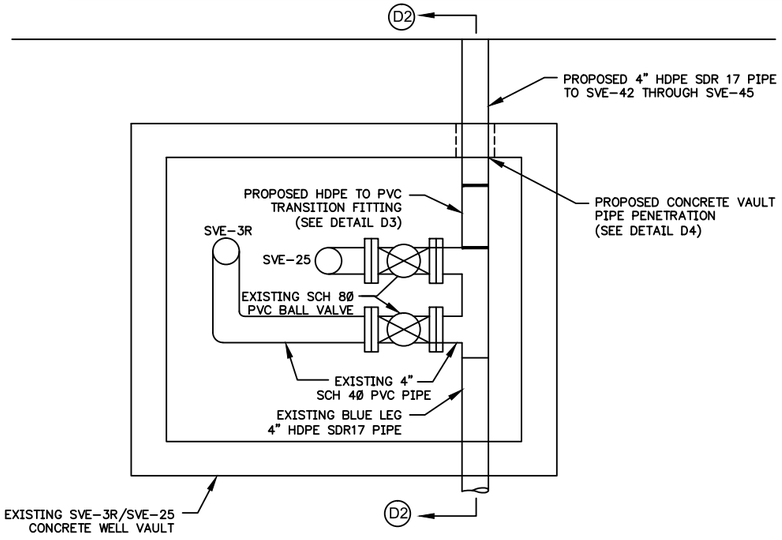
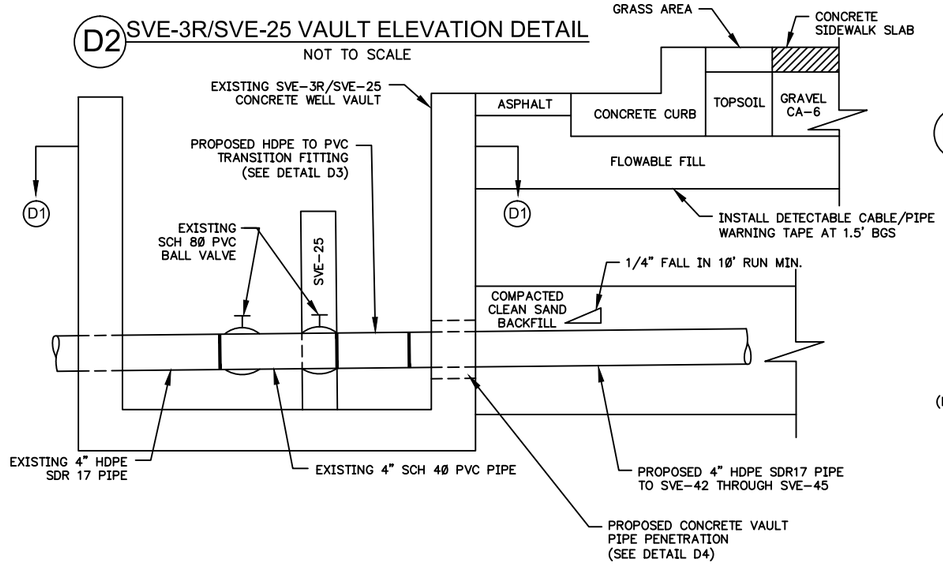


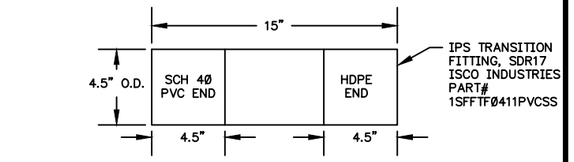
D1 SVE-3R/SVE-25 VAULT PLAN VIEW

NOT TO SCALE



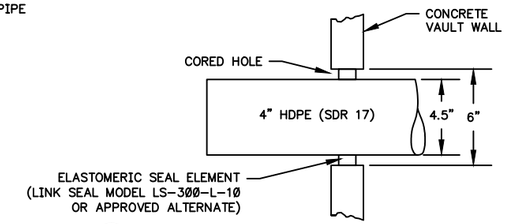
D2 SVE-3R/SVE-25 VAULT ELEVATION DETAIL

NOT TO SCALE



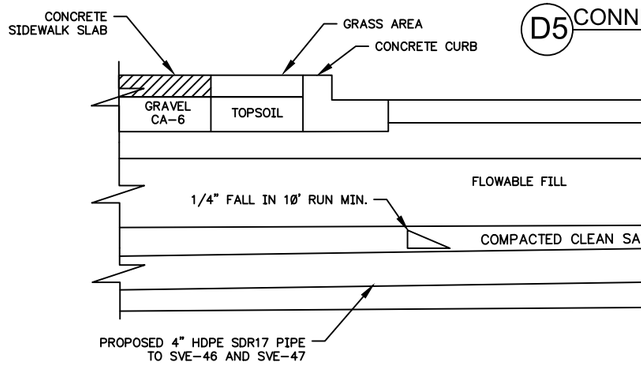
D3 HDPE TO PVC TRANSITION FITTING

NOT TO SCALE



D4 CONCRETE VAULT PIPE PENETRATION DETAIL

NOT TO SCALE

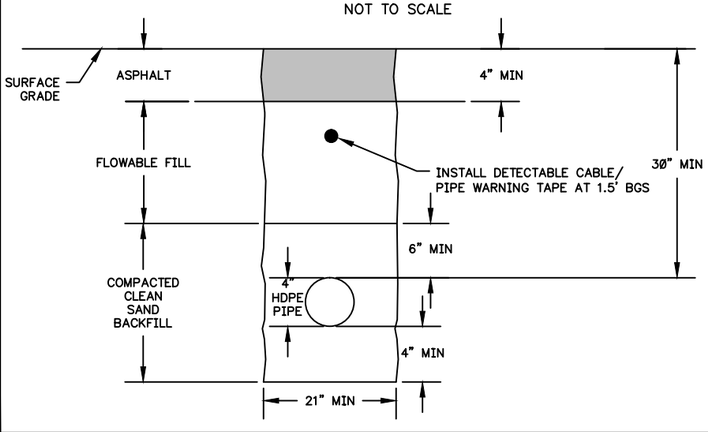


D5 CONNECTION TO EXISTING BLUE LINE ELEVATION DETAIL

NOT TO SCALE

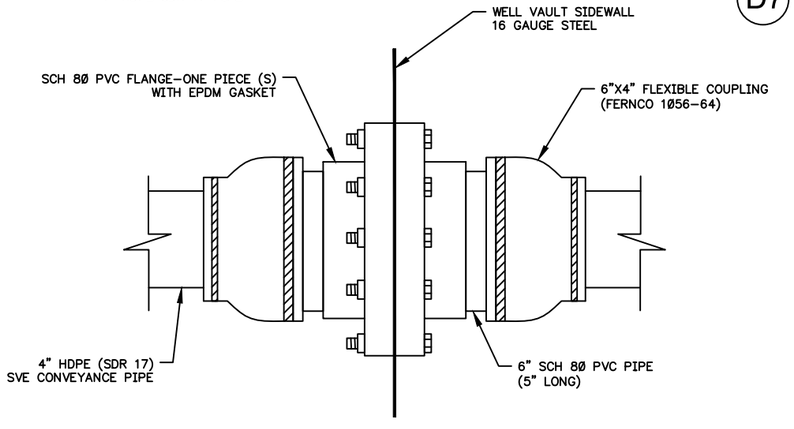
D7 TYPICAL WELLHEAD SCHEMATIC FOR SVE-42 THROUGH SVE-47

NOT TO SCALE



D6 EAST FOURTH ST. RIGHT-OF-WAY PIPE TRENCH DETAIL

NOT TO SCALE



D8 TYPICAL WELL VAULT PIPE PENETRATION DETAIL FOR SVE-42 FOR SVE-47

NOT TO SCALE

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21562973
URS	
DRN. BY: djd May 2014 DSGN. BY: ef CHKD. BY: ef	Piping and Wellhead Details — FIG. NO. C2

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TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION 01000 - SUMMARY OF WORK

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Background Information.

B. General Requirements.

C. Summary of Work.

1.2 DEFINITIONS

A. Key Personnel

Name	Role/Responsibility
Sean Devoy	Principal in Charge (PIC)
Nick Eldred	Project Manager
Eric Fritsch	Task Manager
Erik Arthur	Health and Safety Officer
Dave Lowry	Construction Manager
Jeff Marchetto	Assistant Construction Manager
Steve Tierney	Engineering/Design Support

1.3 BACKGROUND INFORMATION

A. The proposed work presented in this bid package shall be conducted for Shell Oil Products US (SOPUS) under supervision of URS Corporation (URS) at the East 4th and Chaffer Streets Site (Site) located in Roxana, Illinois.

With the exception of a garage located at 150 East 4th Street, the three parcels are currently vacant. The former structures were torn down and the debris was removed. The former foundation walls and basement floors were also removed. Each excavation was backfilled with clean sand brought on-site from an external source. The ground surface was graded and reseeded with perennial grass. Currently, each lot is covered in grass which is regularly mowed and maintained.

The work involves construction of an extension to an existing Soil Vapor Extraction system constructed along the west boundary of the Wood River Refinery North Property, in the Village of Roxana, Illinois and within the Village Public Works Yard (**Figure 1**). The existing System layout is shown in **Figure 2**.

The System extension will be constructed on three vacant lots currently owned by SOPUS located at 146, 147, and 150 East 4th Street within the Village **(Attachment 5 Fig. No. C1)** and will be connected to the existing underground SVE system piping located beneath the centerline of East 4th Street.

The work to be performed includes the flush mount completion of the vaults and their appurtenances for six (6) SVE wells, as shown in **Attachment 5** Construction Drawings. It also includes the construction of the conveyance system for the extracted soil vapors via HDPE pipe, and connection of the newly constructed conveyance system to the existing underground SVE system piping as shown on the Construction Drawings (**Attachment 5**).

1.4 GENERAL REQUIREMENTS

A. Authority of Construction Manager

1. The work will be reviewed, observed and inspected by the on-Site Construction Manager in accordance with the contract, Drawings, Specifications and other applicable guidance documents. The Construction Manager will decide all questions which may arise as to the quality or acceptability of materials furnished and work performed; the manner of performance and rate of progress of the work; the interpretations of the Drawings and Specifications and the acceptable fulfillment of the contract on the part of the Subcontractor. Construction Manager's decisions will be final and binding.

B. Conformity with Drawings and Specifications

1. All work performed and all materials furnished shall be in conformity with the lines, grades, cross sections, dimensions, details, gradations, physical, and chemical characteristics of materials in accordance with tolerances shown on the Drawings and required by the Specifications. Construction tolerances and accuracy limits will be as defined in the respective items of the contract or if not defined, as determined by the Construction Manager.

2. It is the responsibility of the Subcontractor to verify all quantities of materials shown on the Drawings before ordering same, as payment is provided for acceptable materials complete in place. The Subcontractor will not be paid for material rejected due to improper fabrication, excess quantity or for any other reasons within his control.

3. In the event the Construction Manager finds that the work performed or the materials used are not within conformity with the Drawings and Specifications, the affected material or product shall be removed and replaced or otherwise satisfactorily corrected by and at the expense of the Subcontractor.

4. Any deviations from the Drawings, Specifications and approved Shop Drawings will be made only with the approval of the Construction Manager and with the concurrence of the Engineering/Design Support Team. All requests for variance or modification shall be by written communication from the Subcontractor to the Construction Manager.

5. The Specifications accompanying the Drawings are essential parts of the contract and a requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative and to describe and provide for a complete work product. In cases of disagreement, dimensions provided on figures shall govern over scaled dimensions, Drawings shall govern over Specifications, and addenda shall govern over both Specifications and Drawings.

C. Cooperation of Subcontractor

1. The Subcontractor shall designate, to the Construction Manager in writing, the name of a Superintendent, employed by the firm, regardless of how much of the work may be sublet. The Superintendent shall be cooperative, responsible and competent, English speaking, authorized to receive orders and to act for the Subcontractor. The Superintendent will be on-Site and available at all times during System Installation, and all appurtenant work. In the event a competent superintendent is not available, the Construction Manager may suspend work at no additional cost to the Owner until one is available.

D. Removal of Defective and Unauthorized Work

1. All work which has been rejected as being in nonconformance with the Drawings and Specifications shall be remedied or removed and replaced in an acceptable manner by the Subcontractor at his expense. Work done beyond the lines and grades given or as shown on the Drawings, or any extra work done without written authority will be considered as unauthorized and done at the expense of the Subcontractor and will not be paid for. Work so done may be ordered removed at the Subcontractor's expense. Upon failure on the part of the Subcontractor to comply with any order of the Construction Manager made under the provisions of this paragraph, the Construction Manager will have authority to cause defective work to be remedied or removed and replaced and unauthorized work to be removed and the cost thereof may be deducted from any moneys due or to become due to the Subcontractor.

E. Protection of Adjoining Property

1. The Subcontractor shall take proper measures to protect the adjacent or adjoining property; including but not limited to; pipelines (above and underground) railroads, public road way, wells, and electrical service poles and lines which might be damaged by any process of construction, and, in case of any injury or damage resulting from any act or omission on the part of or on behalf of the Subcontractor, he shall restore at his own expense the damaged property to a condition similar or equal to that existing before such injury or damage was done, or he shall make good such injury or damage in an acceptable manner.

F. Subcontractor's Responsibility for Work

1. Until final written acceptance of the project by the Construction Manager, the Subcontractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Subcontractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof which are a portion of the work, not damaged by the Subcontractor or his operations, except for damage to the work due to Acts of God (force majeure) such as earthquake, tidal wave, tornado, hurricane, or other cataclysmic phenomena of nature or acts of governmental authorities. In case of suspension of work for any cause, the Subcontractor shall be responsible for the preservation of all materials. The Subcontractor shall provide suitable drainage and shall erect temporary structures where required.

G. Work near Utilities

1. Any operations by the Subcontractor which are located near any utility shall be accomplished using established industry and utility safety practices and subject to the review and approval of the Construction Manager. The Subcontractor shall consult with the appropriate utility company prior to beginning any such work. All associated costs will be the responsibility of the Subcontractor.

H. Workers and Equipment

1. The Subcontractor shall furnish such suitable machinery, equipment, and construction forces as may be necessary, in the opinion of the Construction Manager, for the proper prosecution of the work. Construction Manager may require the Subcontractor to provide additional resources to maintain the project schedule. Construction Manager may suspend the work until his requests are complied with.

2. All workers employed by the Subcontractor shall have such skill and experience as will enable them to properly perform the duties assigned. Any person employed by the Subcontractor or their Subcontractor who, in the opinion of the Construction Manager, does not perform his work in a proper and skillful manner, or who is disrespectful, intemperate, disorderly or otherwise objectionable, shall at a written request of the Construction Manager be forthwith discharged and shall not be employed again on any of the work without written consent of the Construction Manager.

3. Subcontractor and all employees, Subcontractors, supporting firms and incidental labor shall meet the minimum safety requirements for SOPUS and URS. In addition, KCS and NS training requirements will be met.

I. Final Clean Up

1. Upon completion of the work and before acceptance and final payment is made, the Subcontractor shall clean, remove rubbish and temporary structures from the Site, restore in an acceptable manner all property which has been damaged during the prosecution of the work and leave the Site of the work in a neat and presentable condition throughout.

J. Final Inspection

1. When Subcontractor deems the work finally completed, Subcontractor shall give written notice thereof to Contractor. Within seven (7) days after receipt of such notice, Contractor will determine if the Work has been completed as required and advise Subcontractor in writing either (i) that the work has been finally completed or (ii) that the work has not been finally completed, stating reasons therefor. In the event the Contractor advises Subcontractor that the work is not finally complete, Subcontractor will promptly complete the work and give written notice to Contractor when it has done so. The procedure stated herein shall be repeated until the work has been satisfactorily and finally completed and the Certificate of Completion has been submitted by Subcontractor and accepted in writing by Contractor. The work will be deemed finally complete as of the date of Contractor's notice to Subcontractor to that effect.

1.5 SUMMARY OF WORK

A. General

1. The Subcontractor shall work closely and communicate regularly with the Construction Manager in order to minimize conflicts and expedite the completion of the work. The Construction Manager serves as the Owner's representative.

2. All equipment and materials on-Site during the work will be the responsibility of the Subcontractor. The Owner shall not be responsible for theft, vandalism or damage to any of the equipment or materials.

3. Subcontractor shall adhere to all health and safety requirements as identified in the Site Health and Safety Plan (HASP) and as required by SOPUS and URS corporate safety requirements.

4. Subcontractor shall prepare and submit for review and approval by the Construction Manager all Work Plans, Safety Plans, and Construction Plans as required by these Specifications, or any other documents included as part of the SVE Extension Bid Document package.

5. Soil generated during excavation that is not used as backfill must be containerized, labeled, and staged on-Site. Soils shall be disposed of under existing non-hazardous profiles established for the Site. The Subcontractor shall be responsible for delivery of roll-off boxes and arranging waste hauling and disposal. Soil must be transported by and disposed of at SOPUS-approved facilities according to all local, state, and federal regulations.

B. Work Covered by Contract Documents

1. Work discussed within this document, referred to as "System Installation", involves construction of an extension to an existing Soil Vapor Extraction system constructed along the west boundary of the Wood River Refinery North Property, in the Village of Roxana, Illinois and within the Village Public Works Yard, as shown on the included Drawings.

2. Principal Work Items to be performed by Subcontractor:

   a. Mobilize to Site.

   b. Prepare Site to include erosion control, place protective barriers, and initiate stormwater management measures.

   c. Provide all roll-off boxes for general refuse/construction debris and soil containerization. Arrange for disposal of all materials with SOPUS-approved haulers and disposal facilities.

   d. Excavate trenches for subsurface conveyance pipe and SVE well vaults.

   e. Place fill and install conveyance pipe, SVE well vaults, and make all necessary piping connections.

   f. Perform pressure testing of piping as required.

   g. Perform surface repairs to areas impacted by excavation or other construction activities.

   h. Perform Site clean-up activities and demobilize.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

Not used.

END OF SECTION 01000

SECTION 02010 - EROSION CONTROL

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Furnish labor, equipment and materials as specified herein to erect, maintain and remove a temporary sediment barrier or equivalent attached to supporting posts and entrenched.

B. Subcontractor shall be responsible for prevention of runoff from Site causing erosion products to be deposited at locations outside the limits of the work.

C. Subcontractor shall collect any eroded materials from their off-Site locations and return these to the Site.

D. Subcontractor shall be responsible for repairing and restoring erosion which occurred during construction to original conditions.

1.2 SUBMITTALS

Not used.

1.3 LOCATIONS FOR USE

A. Below disturbed areas where sheet and/or fill erosion may occur.

B. At locations hydraulically downgradient of Site construction activities and at locations indicated on the Drawings.

C. At locations selected by the Construction Manager to prevent sediment migration.

PART 2. PRODUCTS

2.1 MATERIALS

A. Geotextile (filter) shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn.

B. Geotextile (filter) shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable exposed life at a temperature range of 0° to 120°F.

C. Stakes for silt fences shall be 1 x 2 inch wood with length equal to the height of silt fence plus 12 inches. No metal stakes are permitted due to potential underground utilities.

D. Subcontractor may identify alternate materials for erosion control. Alternate materials shall be submitted to the Construction Manager for evaluation of equivalency prior to installation.

PART 3. EXECUTION

3.1 REQUIREMENTS

A. Erosion control devices shall be maintained (or installed if needed) to prevent the transport of material or soil by runoff water from construction and other land disturbing activities.

B. Best Management Practices shall be utilized in the installation of the devices to prevent and/or correct problems related to the transport of material or soil by runoff water.

C. All devices shall be installed in accordance with the standards and requirements of the Illinois Environmental Protection Agency (IEPA) or as required by the Drawings or Specifications.

3.2 INSTALLATION

A. The geotextile shall be delivered to the jobsite in a continuous roll and cut to the length of the barrier to avoid the use of joints. When joints are necessary, it shall be spliced together only at a support post, with a minimum 6-inch overlay, and securely sealed.

B. Posts shall be spaced a maximum of 5 feet apart at the barrier location and driven securely into the ground a minimum of 18 inches.

C. A trench shall be hand excavated upslope from the barrier approximately 6 x 6 inch deep along the line of posts.

D. Geotextile shall be fastened to the posts by a minimum of 10 gauge wire. The geotextile shall be fastened to each post at a minimum of 4 locations and shall extend into the trench.

E. The trench shall be backfilled over the filter fabric.

F. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area construction is completed.

3.3 MAINTENANCE DURING CONSTRUCTION

A. The Subcontractor shall inspect erosion prevention measures at least once each week and following any rainfall event of 0.5 inches or greater. During periods of extended rainfall, all measures shall be inspected daily.

B. If the geotextile on a silt fence decomposes or become ineffective prior to the end of the desired use, the Subcontractor shall replace the fabric promptly.

C. Sediment and other eroded materials deposited against the barrier shall be checked after each storm event. They must be removed when deposits reach approximately 1/3 the height of the barrier, or if deformation of the barrier has occurred.

D. Any sediment deposits remaining in place after the silt fence or barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

END OF SECTION 02010

SECTION 02020 - STORMWATER CONTROL DURING CONTRUCTION

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Maintain adequate Site drainage.

B. Collection and routing of stormwater.

C. Collection and disposal of groundwater and contact stormwater.

1.2 SUBMITTALS

Not used.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1 SURFACE WATER CONTROL

A. Subcontractor shall furnish, install, maintain and operate all equipment and materials needed to prevent, control and remove surface water within or adjacent to the area of work.

B. Subcontractor shall provide and maintain berms, curbs, surface drainage swales or runs as necessary, to prevent surface water from entering fill placement areas.

C. Subcontractor shall immediately remove impounded water that affects any area of the Work.

3.2 GROUND WATER AND CONTACT STORMWATER CONTROL

A. Subcontractor shall furnish, install, maintain, and operate all equipment and materials to prevent ground water and stormwater from flowing into excavations. Note: Stormwater that requires manual evacuation from an excavation (i.e. pumped from an excavated trench or vault) must be collected in Department of

Transportation (DOT)-approved 55-gallon steel drums or a frac tank (both with secondary containment) and staged on-Site in an area approved by the Construction Manager to be properly characterized by URS personnel.

B. The labeling of storage containers, weekly inspections and overall management of the waste and containers will be performed by URS personnel. The containerizing, managing, and relocating within the Site of the waste is performed by both URS personnel and Subcontractors depending on the activity being performed. Subcontractors must notify URS personnel of material being generated so that the management procedures described herein can be performed.

3.3 MAINTENANCE DURING CONSTRUCTION

A. The Subcontractor shall maintain adequate drainage of construction work areas of the Site during progress of the work such that ponding of rainwater does not occur.

B. Stormwater drainage shall be diverted away from the construction and work areas of the Site.

END OF SECTION 02020

SECTION 02210 - EXCAVATION AND REMOVALS

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Mechanical Excavation

B. Protection

C. Removal of Excavated Soils.

1.2 SUBMITTALS

Not used.

1.3 PROJECT RECORD DOCUMENTS

A. Subcontractor shall maintain logs of all soils excavated and removed from the Site (including but not limited to manifests, disposal tickets and volumes).

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1 EQUIPMENT

A. Mechanical Excavation Equipment

1. Backhoe
2. Track Excavator

3.2 EXCAVATION

A. All excavations shall comply with the requirements of OSHA 29 CFR Part 1926 Subpart P.

B. Limits

1. Subcontractor shall excavate to lines, grades, and dimensions, as shown on the Drawings.

2. Subcontractor shall minimize excavation beyond limits shown unless otherwise approved in writing by the Construction Manager.

3. Subcontractor shall design and use sloping, sheeting, shoring and bracing as necessary to protect existing structures from damage.

4. Subcontractor shall grade the surface of over-excavated areas by creating a smooth transition to adjoining areas, and slope to drain.

5. Over-excavated areas shall be backfilled and compacted by the Subcontractor in accordance with these specifications at no expense to the Owner unless additional excavation was previously approved by the Construction Manager.

C. At the conclusion of each day's work, Subcontractor shall backfill, barricade or adequately fence and protect all trenches and/or excavations in accordance with the requirements of the Site HASP. At a minimum, all open excavations must be covered by ½" thick plywood secured in place with sand bags (or similarly weighted material), and surrounded by temporary chain link fence panels that are at least six feet in height.

3.2 PROTECTION

A. Traffic Control

1. Keep all roads, sidewalks, and parking areas that are not part of this project usable at all times.

2. The Subcontractor shall provide all necessary barricades, lights, signs, signals, etc., for the protection of the workers and the public, as established by the Occupational Safety and Health Administration (OSHA) Construction Safety and Health Regulation 29 CFR, Part 1926, Subpart G, Signs, Signals and Barricades, and in Subpart P- Excavations, trenching and shoring, and Illinois DOT Standard Specifications for Road and Bridge Construction, latest edition.

3.2 REMOVAL AND DISPOSAL FROM SITE

A. Non-Hazardous Soil

1. The waste storage area for this waste stream will be on-Site and approved by the Construction Manager.

2. The following procedures are to be followed for the handling and management of the soil that is non-hazardous waste at the Site:

a. Once removed from the ground the soil cuttings will be collected by one of the following means:

i. Hand shovel

ii. Mini-loader, backhoe, or excavator bucket or similar

iii. Vacuum truck tank

b. The means used to collect the soil cuttings will be closed or covered to ensure no spillage of the material during movement.

3. The soil cuttings will be transferred into an appropriate, designated non-hazardous waste storage container:

a. A covered and lined roll-off box; or

b. A 55-gallon steel drum approved by Illinois DOT for transport of the material.

4. Waste storage containers must remain closed and secured unless waste is actively being added or removed.

5. Do not completely fill containers. Roll-off boxes should not be filled to more than about 2/3 of full capacity and 55-gallon drums should not be filled more than about 90% of their capacity.

B. Listed Hazardous Soil

Not Used

END OF SECTION 02210

SECTION 02250 - TRENCH BACKFILL

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Pipe Bedding and Backfill.

1.2 DESCRIPTION OF WORK

A. Stabilize trench and install pipe bedding and backfill materials for sub-grade pipe connections at terminus of HDPE.

B. Place backfill material in trench.

1.3 SUBMITTALS

Not Used

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stockpiling of backfill material on-Site will be allowed only with the Construction Manager's approval at predetermined locations.

1.5 MEASUREMENT AND PAYMENT

A. General: The following items are incidental to the underground systems being installed and will not be paid for separately:

1. Standard trench excavation.
2. Removal of abandoned private utilities encountered during trench excavation.
3. Furnishing and placing bedding material.
4. Placing and compacting backfill material.
5. Dewatering.
6. Sheeting, shoring, and bracing.
7. Temporary support for existing water, sewer, gas, telephone, electric, and other utilities or services that cross the trench.

8. Utility Location Tape.

B. Trench Compaction Testing:

1. The Subcontractor is not responsible for trench compaction testing unless otherwise specified in the contract documents.

2. If testing is required, the Subcontractor will be responsible for payments associated with all retesting resulting from failure of initial tests.

PART 2. PRODUCTS

2.1 BEDDING MATERIAL

A. Bedding sand (bar sand or concrete sand).

2.2 BACKFILL MATERIAL

A. Soil generated by trench excavation activities.

PART 3. EXECUTION

3.1 TRENCH PROTECTION

A. Install adequate trench protection (sheeting, shoring, and bracing) to prevent ground movement or damage to adjacent structures, pipelines, and utilities.

B. Move trench boxes carefully to avoid disturbing pipe, bedding, or trench wall.

3.2 DEWATERING

A. Maintain water levels below the bottom of trench excavation.

B. Perform the dewatering operation according to the dewatering plan approved by the Construction Manager. The dewatering plan may be modified to meet actual field conditions, with approval of the Construction Manager.

C. Ensure operation of the dewatering system does not damage adjoining structures and facilities. Cease dewatering operations and notify the Construction Manager if damage is observed.

D. Discharged Water:

1. Subcontractor will comply with SECTION 02020.

2. Do not discharge water into sanitary sewers.

3. Discharging water into storm sewers requires Construction Manager's approval.

4. Obtain permission of adjacent property owner prior to discharging water onto their property.

5. Maintain and control water discharge as necessary to prevent a safety hazard for vehicular and pedestrian traffic.

6. Direct water discharge away from electrical facilities or equipment.

7. Use dewatering equipment that will minimize disturbance from noise and fumes.

8. Protect discharge points from erosion. Provide sediment control for sediment contaminated water discharged directly from trench.

3.3 PIPE BEDDING AND BACKFILL

A. General: Comply with Construction Drawings C1 and C2**,** as appropriate.

1. After pipe installation, place remaining bedding material and immediately place backfill in trench being careful to not damage piping.

2. Adjust the moisture content of excessively wet, but otherwise suitable, backfill material by spreading, turning, aerating, and otherwise working material as necessary to achieve required moisture range.

3. Adjust the moisture content of excessively dry, but otherwise suitable, backfill material by adding water, then turning, mixing, and otherwise blending the water uniformly throughout the material until the required moisture range is achieved.

4. Hydraulic compaction (flooding with water) is not allowed unless authorized by the Construction Manager.

B. Pipe Bedding:

1. Granular Material:

a. Granular bedding material shall consist of clean bar sand or concrete sand.

b. Comply with **Construction Drawings C1 and C2**.

c. Place bedding material in the bottom of the trench in lifts no greater than 6 inches thick. Consolidate and moderately compact bedding material.

d. Shape bedding material to evenly support pipe at the proper line and grade, with full contact under the bottom of the pipe. Vacuum Excavate for pipe bells.

e. Install pipe components.

f. Place, consolidate, and moderately compact additional bedding material adjacent to the pipe to a depth equal to 1/6 the outside diameter of the pipe.

C. Pipe Backfill

1. Granular Material

a. Granular backfill material shall consist of clean bar or concrete sand.

b. Comply with Construction Drawings C1 and C2.

c. Place, consolidate, and moderately compact additional backfill material adjacent to the pipe to finish grade, being careful to not damage piping.

END OF SECTION 02250

SECTION 03000 - SYSTEM PIPING

PART 1. GENERAL

1.6 SECTION INCLUDES

A. SVE extension conveyance piping.

B. Connections at well vaults and existing SVE piping.

1.7 DELIVERY STORAGE AND HANDLING

A. DESCRIPTION: The work in this section consists of providing HDPE pipe and fittings.

B. PLACEMENT: Pipe and tubing shall be placed as shown on the Drawings.

C. PRODUCT HANDLING: Handle pipe, tubing, and fittings to insure delivery in a sound undamaged condition.

D. JOB CONDITIONS: Do not lay pipe or tubing when Site or weather conditions are not suitable for such work.

1.8 SUBMITTALS

A. Submit Product Data and material lists from manufacturer for system piping each product to be used and identified by manufacturer and type number.

B. Installation Schedule.

1.9 LOCATIONS FOR USE

A. As indicated on the Construction Drawings.

1.10 REFERENCES

A. American National Standards Institute (ANSI), ASTM, Federal Specifications (FS), International Standards Organization (ISO), and manufacturer's printed recommendations.

B. Compressed Gas Association; CGA G-4.1 – 2004; "Cleaning Equipment for Oxygen Service" – Fifth Edition.

C. ASTM D 3350, ASTM F 714, ASTM D 3261, ASTM A 653

PART 2. PRODUCTS

2.1 MATERIALS

A. HDPE Pipe: Pipe shall be manufactured from a PE 3608/3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D 3350 with a cell classification of 345464C/E. Pipe shall have a manufacturing standard of ASTM F 714. Pipe shall be DR 17 (100psi WPR) unless otherwise specified on the Drawings. The pipe shall contain no recycled compounds except those generated in the manufacturer's own plant from resin of the same specification from the same raw material.

B. HDPE Fittings: Butt Fusion Fittings - Fittings shall be PE3608/3408 HDPE, minimum cell classification of 345464C/E as determined by ASTM D 3350. Molded butt fusion fittings shall have a manufacturing standard of ASTM D 3261. Molded fittings shall have the same pressure rating as the pipe unless otherwise specified on the Drawings. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

C. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 3608/3408 HDPE, minimum cell classification of 345464C/E as determined by ASTM D 3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D 3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the Drawings.

2.2 GENERAL EXECUTION

A. PIPE AND FITTINGS: Size as indicated on the Drawings. Install as shown in accordance with manufacturer’s recommendations.

B. HAULING, UNLOADING and DISTRIBUTING PIPE and TUBING:
During loading, transportation and unloading, every precaution shall be taken to prevent damage to the pipe/tubing. No pipe or tubing shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe or tubing damaged shall be replaced.

C. EXCAVATION AND TRENCHING: If required, all excavation and trenching will conform to SECTION 02210.

D. FUSION: Sections of HDPE pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures

should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400-450°F, alignment, and an interfacial fusion pressure of 75 psi. The butt fusion joining will produce a joint with weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the QC records.

E. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a ductile iron back-up ring or HDPE Mechanical Joint adapter with a ductile iron back-up ring.

F. Socket fusion, hot gas fusion, threading, solvents, and epoxies shall not be used to join HDPE pipe.

2.3 INSPECTION

A. INSPECTION: Inspect the pipe/tubing for defects before installation. Defective, damaged or unsound pipe or tubing will be rejected.

2.4 TESTING

A. Pressure testing of installed HDPE shall be performed in accordance with ASTM F2786-10. The HDPE piping will be subjected to an extraction vacuum of up to 30 inches water vacuum and up to 450 scfm soil gas flow rate during SVE system operation. Piping and appurtenance materials must maintain integrity when subjected to this vacuum during system operation. To confirm integrity, the system must be shown to maintain a pressure of 10 psi for one hour.

END OF SECTION 03000

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-42

Start Date: 7/29/14
Completion Date: 8/6/14
Casing Elevation: 441.37
Ground Elevation: 442.08

Coordinates
Northing: 793428.34
Easting: 2322228.28

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					5.1			FILL	Brown, topsoil with gravel (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					9.3			CL	Brown, Silty CLAY (CL)	
5					5.3			ML	Dry, brown, Clayey SILT (ML)	
					2.9				Becomes sandy, clay grades out	
					8.8				Becomes moist	
10		24	11	2 3 4 5	1.4			SP	Loose, moist, brown, fine grained SAND (SP), with silt	
		24	14	2 3 3 3	2.5				Silt grades out	
15		24	16	1 2 3 4	2.4					
		24	18	2 3 5 5	2.5				Becomes dark brown, fine to medium grained	
		24	16	2 4 5 5	3.5					
20		24	18	2 3 5 8	4.6					
		24	18	4 7 7 10	268			ML	Soft, dry, brown, fine SILT (ML)	Hydrocarbon like odor 22' to 32'
				3 7				SP	Becomes black Loose, dry, light brown, fine grained SAND (SP)	

Completion Depth: 36.0 ft bgs
Project No.: 21562973.19200
Project Name: 4th Street SVE System Extension
Drilling Contractor: Roberts Environmental Drilling Inc.
Drilling method: HSA Rig Type: CME 75
Drilled by: J. Crank
Logged by: E. Arthur

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

URS (ENVIRON) LOG W/ BLOWCOUNTS+1 WELL P:\RESOURCES\GINTDATA\GINT\PROJECTS\ROXANA 4TH ST SVE EXTENSION (2014).GPJ P:\RESOURCES\GINTDATA\GINT\ENVIRONMENTAL\URSSTLEV.GLB 12/1/14

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-42

Start Date: 7/29/14
Completion Date: 8/6/14
Casing Elevation: 441.37
Ground Elevation: 442.08

Coordinates
Northing: 793428.34
Easting: 2322228.28

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		24	17	10 13	46.4			SP	Same: Loose, dry, light brown, fine grained SAND (SP)	
		24	21	5 7 7 9	545			CL	Soft, moist, gray, low plastic CLAY (CL)	
		24	22	7 9 13 15	682			ML	Soft, dry, gray, very fine SILT (ML) With sand	
30		24	20	6 9 9 9	645			SP	Loose, dry, gray, fine grained SAND (SP)	
		24	22	3 6 8 10	750			ML	Soft, dry, gray, very fine SILT (ML) Becomes brown, sandy Becomes gray	
		24	20	3 8 11 14	301					
35								SP	Loose, dry, brown, fine grained SAND (SP)	
									Bottom of boring at 36' bgs	
40										
45										

Completion Depth: **36.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.
▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic
USC based on field visual observations

URS

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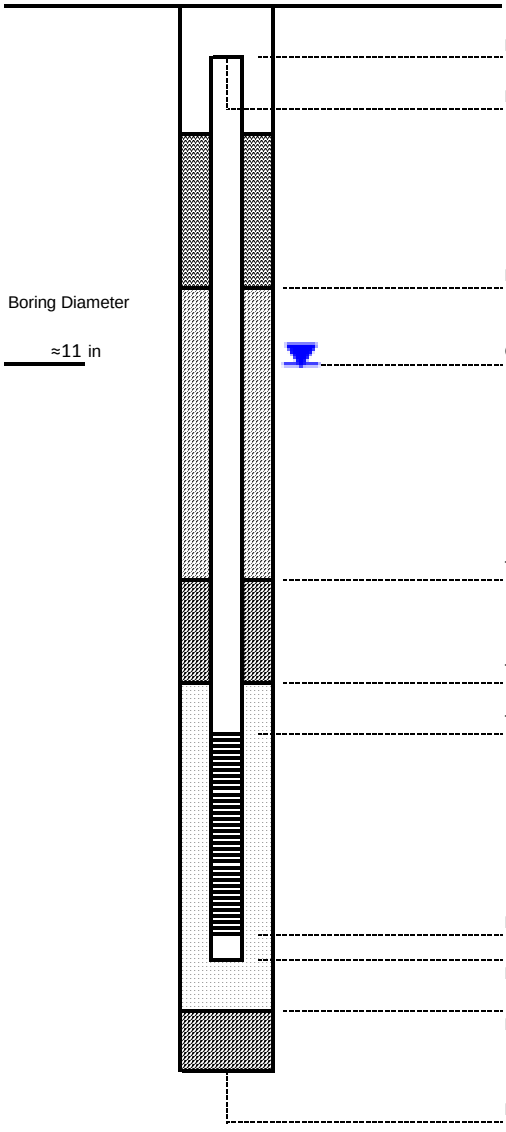
SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-42
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	150 East 4th St.	Date Completed:	8/6/2014	Boring ID:	SVE-42
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	10:15 am on 8/6/2014	Northing:	793428.34
Driller:	J. Crank	Type of Rig:	CME-75	Easting:	2322228.28
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur	Completion Zone:	25-35 ft bgs		



	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		442.08
Depth of Riser Below Ground:	0.71	
Elevation of Top of Riser Pipe:	0.71	441.37
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	438.08
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	20	422.08
Type of Seal:	Bentonite Chips	
Top of Filter Pack	23	419.08
Top of Screen	25	417.08
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	35	407.08
Bottom of Blank Casing:	35.25	406.83
Backfill/Seal Below Well:	35.25	406.83
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	36	406.08

DIAGRAM IS NOT TO SCALE

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-43

Start Date: 7/29/14
Completion Date: 8/19/14
Casing Elevation: 441.35
Ground Elevation: 442.12

Coordinates
Northing: 793428.73
Easting: 2322147.36

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					9.6			FILL	Brown, topsoil with gravel (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					7.1					
5					6.3			ML	Dry, brown, sandy SILT (ML)	
					4.2					
					3.2				Beomes moist	
10		24	12	1 1 1 1	3.0			SP	Loose, moist, light brown, fine grained SAND (SP)	
		24	12	2 2 2 2	4.4					
15		24	15	2 2 2 3	4.1				Becomes brown, fine to medium grained	
		24	16	1 2 3 3	4.4					
		24	18	1 3 4 5	3.5					
20		24	19	2 3 2 3	3.9			CL	Soft, moist , brown, low plastic CLAY (CL)	
								ML	Soft, moist, light brown, very fine, Clayey SILT (ML)	
		24	16	3 8 8 11	2.1				Becomes very stiff, dry, light brown, sandy, clay grades out	
				3 8					Becomes soft	

Completion Depth: **36.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank/S. Seymore**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-43

Start Date: 7/29/14
Completion Date: 8/19/14
Casing Elevation: 441.35
Ground Elevation: 442.12

Coordinates
Northing: 793428.73
Easting: 2322147.36

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		24	19	8 8	2.5			ML	Same: Soft, dry, light brown, Sandy SILT (ML)	
		24	18	3 8 9 9	3.0			SP	Loose, moist, light brown, medium grained SAND (SP)	
		24	19	2 2 6 9	5.7			CL	Soft, moist, light brown, low plastic CLAY (CL)	
30		24	20	3 6 6 9	531			SP	Loose, moist, light brown, fine grained SAND (SP)	Hydrocarbon like odor 30' to 32'
								ML	Soft, moist, gray, very fine SILT (ML), with sand	
		24	22	4 4 4 4	7.6			SP	Loose, moist, gray, fine grained SAND (SP)	
35		24	24	2 2 2 4	30.8			SP	Becomes medium grained	
								CL	Soft, moist, gray, medium plastic CLAY (CL) Becomes low plastic, with silt	
									Bottom of boring at 36' bgs	
40										
45										

Completion Depth: **36.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank/S. Seymore**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: _____ ft., After _____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

URS (ENVIRON) LOG W/ BLOWCOUNTS+1 WELL P:\RESOURCES\GINTDATA\GINT\PROJECTS\ROXANA 4TH ST SVE EXTENSION (2014).GPJ P:\RESOURCES\GINTDATA\GINT\ENVIRONMENTAL\URSSTLEV.GLB 12/1/14

SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-43
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	146 East 4th St.	Date Completed:	8/19/2014	Boring ID:	SVE-43
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	10:15 am on 8/19/2014	Northing:	793428.73
Driller:	J. Crank / S. Seymore	Type of Rig:	CME-75	Easting:	2322147.36
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur	Completion Zone:	25-35 ft bgs		

Boring Diameter

≈11 in

	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		442.12
Depth of Riser Below Ground:	0.77	
Elevation of Top of Riser Pipe:	0.77	441.35
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	438.12
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	20	422.12
Type of Seal:	Bentonite Chips	
Top of Filter Pack	23	419.12
Top of Screen	25	417.12
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	35	407.12
Bottom of Blank Casing:	35.25	406.87
Backfill/Seal Below Well:	35.25	406.87
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	36	406.12

DIAGRAM IS NOT TO SCALE

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-44

Start Date: 7/29/14
Completion Date: 8/20/14
Casing Elevation: 441.53
Ground Elevation: 442.46

Coordinates
Northing: 793332.43
Easting: 2322146.79

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					6.0			FILL	Brown topsoil (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					3.3			ML	Brown, Sandy SILT (ML)	
5					2.6					
					1.3					
					0.8			SM	Brown, poorly graded, fine to medium grained, Silty SAND (SM)	
10		24	12	1 2 4 7					Loose, moist, brown, fine grained SAND (SP), with silt	
		24	24	4 6 7 9				SP	Silt grades out Becomes dark brown, medium grained	
15		24	18	5 5 4 3						
		24	12	1 2 4 5				CL	Soft, wet, gray, low plastic, Silty CLAY (CL)	
								ML	Loose, moist, brown, very fine SILT (ML), with sand	
		24	18	3 3 3 3					Loose, moist, brown, fine to medium grained SAND (SP)	
20		24	20	2 2 4 4				SP		
		24	16	2 3 4 5					Becomes dry, medium grained	
				2 3					Becomes light brown	

Completion Depth: **36.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur/L. Rathnow**

Water Depth: NE ft., After NE hrs.
Water Depth: _____ ft., After _____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-44

Start Date: 7/29/14
Completion Date: 8/20/14
Casing Elevation: 441.53
Ground Elevation: 442.46

Coordinates
Northing: 793332.43
Easting: 2322146.79

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
30		24	16	4 7					Same: Dry, moist, light brown, medium grained SAND (SP)	
		24	18	2 4 8 8						
		24	14	4 6 7 12					Grades to medium to coarse grained	
35		24	16	4 8 8 8				SP		
									Bottom of boring at 36' bgs	
40										
45										

Completion Depth: **36.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur/L. Rathnow**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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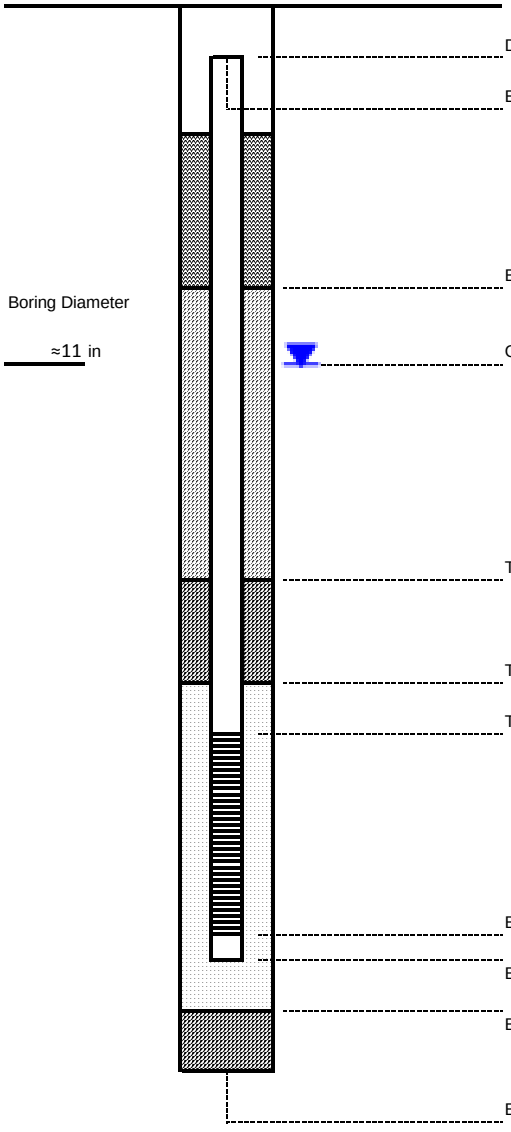
SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-44
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	146 East 4th St.	Date Completed:	8/20/2014	Boring ID:	SVE-44
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	11:10 am on 8/20/2014	Northing:	793332.43
Driller:	J. Crank	Type of Rig:	CME-75	Easting:	2322146.79
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur / L. Rathnow	Completion Zone:	25-35 ft bgs		



	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		442.46
Depth of Riser Below Ground:	0.93	
Elevation of Top of Riser Pipe:	0.93	441.53
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	438.46
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	20	422.46
Type of Seal:	Bentonite Chips	
Top of Filter Pack	23	419.46
Top of Screen	25	417.46
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	35	407.46
Bottom of Blank Casing:	35.25	407.21
Backfill/Seal Below Well:	35.25	407.21
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	36	406.46

DIAGRAM IS NOT TO SCALE

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-45

Start Date: 7/29/14
Completion Date: 8/6/14
Casing Elevation: 441.39
Ground Elevation: 442.58

Coordinates
Northing: 793340.07
Easting: 2322208.17

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					3.6			FILL	Light brown to brown topsoil with gravel (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					9.1					
5					4.7			ML	Brown, fine SILT (ML)	
					4.3				Becomes sandy	
					4.2				Becomes more coarse	
10		24	14	1 2 2 4	0.9			SP	Loose, dry, brown, fine grained SAND (SP)	
		24	18	2 5 5 5	7.0				Becomes light brown	
15		24	17	2 5 4 4	7.2				Becomes moist, brown, medium grained	
		24	19	1 2 2 3	8.2				Becomes dry, fine to medium grained	
		24	18	1 3 3 4	10.1				Becomes moist	
20		24	18	2 3 4 4	10.7				Becomes dry	
		24	19	2 2 4 4	9.4					
				1 3						

Completion Depth: 43.0 ft bgs
Project No.: 21562973.19200
Project Name: 4th Street SVE System Extension
Drilling Contractor: Roberts Environmental Drilling Inc.
Drilling method: HSA Rig Type: CME 75
Drilled by: J. Crank
Logged by: E. Arthur

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-45

Start Date: 7/29/14
Completion Date: 8/6/14
Casing Elevation: 441.39
Ground Elevation: 442.58

Coordinates
Northing: 793340.07
Easting: 2322208.17

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		24	20	4 5	12.4				Same: Loose, dry, brown, fine to medium grained SAND (SP)	
		24	16	2 2 3 5	12.5			SP		
		24	20	3 8 7 11	12.7			CL	Soft, moist, brown, low plastic CLAY (CL) with medium to fine grained sand Loose, moist, brown, medium grained SAND (SP)	
30		24	16	4 7 8 11	12.3					
		24	16	2 9 9 13	12.4			SP	Becomes medium dense	
35		24	18	2 4 8 11	11.5					
		24	19	3 5 7 12	392				Becomes dry, fine to medium grained	
		24	20	2 6 7 10	248			CL	Medium stiff, dry, gray, medium plastic CLAY (CL) Stiff, dry, gray, very fine SILT (ML)	
40		24	22	3 6 6 7	794			ML	Become moist Loose, moist, gray, fine to medium grained SAND (SP)	
								SP	Becomes medium grained	
45									Bottom of boring at 43' bgs	

Completion Depth: **43.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: _____ ft., After _____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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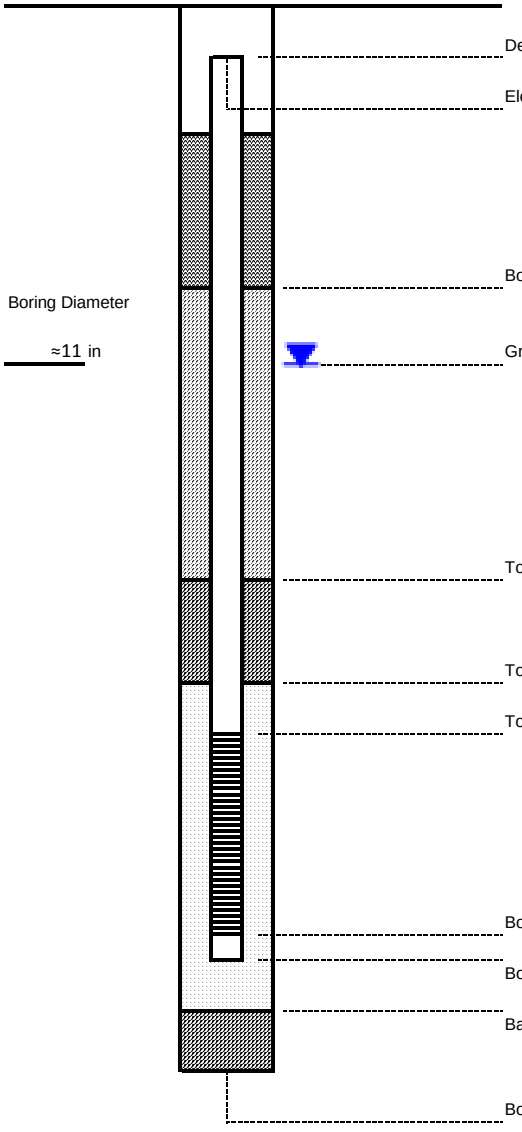
SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-45
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	150 East 4th St.	Date Completed:	8/6/2014	Boring ID:	SVE-45
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	13:45 pm on 8/6/2014	Northing:	793340.07
Driller:	J. Crank	Type of Rig:	CME-75	Easting:	2322208.17
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur	Completion Zone:	37-42 ft bgs		



	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		442.58
Depth of Riser Below Ground:	1.19	
Elevation of Top of Riser Pipe:	1.19	441.39
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	438.58
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	32	410.58
Type of Seal:	Bentonite Chips	
Top of Filter Pack	35	407.58
Top of Screen	37	405.58
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	42	400.58
Bottom of Blank Casing:	42.25	400.33
Backfill/Seal Below Well:	42.25	400.33
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	43	399.58

DIAGRAM IS NOT TO SCALE

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-46

Start Date: 7/29/14
Completion Date: 8/4/14
Casing Elevation: 441.85
Ground Elevation: 442.85

Coordinates
Northing: 793260.69
Easting: 2322209.79

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					3.6			FILL	Brown, silty topsoil, with gravel (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					5.4			ML	Brown SILT (ML)	
5					7.2			ML	Becomes sandy	
					5.6			SM	Brown, fine to medium grained, Silty SAND (SM)	
					4.6			SM	Silt grades out	
10		24	16	1 2 2 2	0.4			SM	Becomes loose, dry, fined grained, silty	
		24	18	2 2 4 7	1.1			SP	Loose, dry, brown, fine grained SAND (SP)	
15		24	20	3 5 7 7	3.0			SP	Becomes fine to medium grained	
		24	20	2 4 4 8	4.4			CL	Soft, moist, gray, low plastic, Silty CLAY (CL)	
		24	20	2 3 5 8	5.4			SP	Loose, dry, light brown, medium grained SAND (SP)	
20		24	12	2 3 5 10	5.1			SP		
		24	20	2 3 5 10	4.3			SP		
				4 4				SP		

Completion Depth: **26.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-46

Start Date: 7/29/14
Completion Date: 8/4/14
Casing Elevation: 441.85
Ground Elevation: 442.85

Coordinates
Northing: 793260.69
Easting: 2322209.79

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		24	19	6 8	4.5			SP	Same: Loose, dry, light brown, medium grained SAND (SP)	
									Bottom of boring at 26' bgs	

30
35
40
45

Completion Depth: **26.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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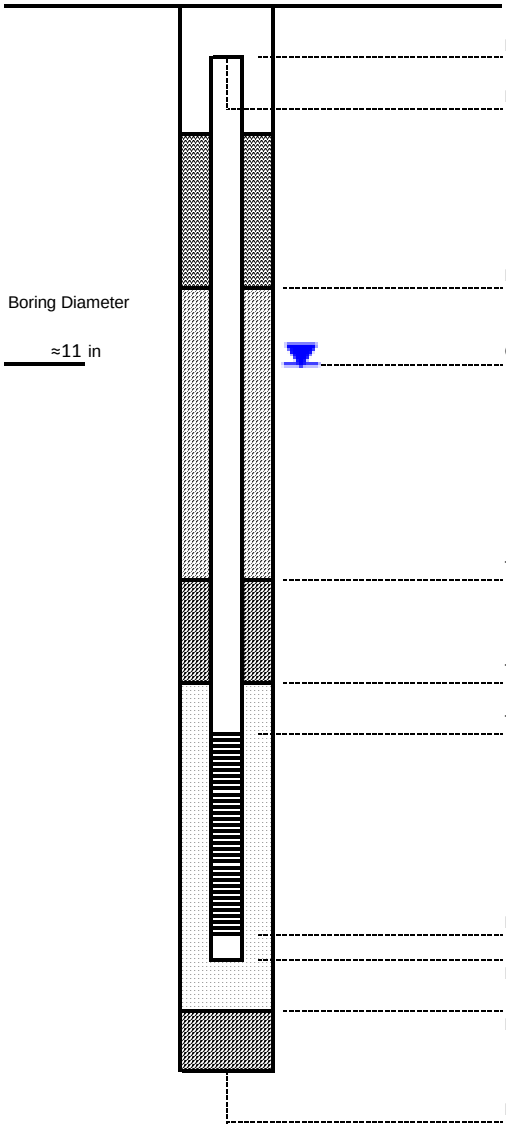
SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-46
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	147 East 4th St.	Date Completed:	8/4/2014	Boring ID:	SVE-46
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	12:30 pm on 8/4/2014	Northing:	793260.69
Driller:	J. Crank	Type of Rig:	CME-75	Easting:	2322209.79
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur	Completion Zone:	15-25 ft bgs		



	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		442.85
Depth of Riser Below Ground:	1.0	
Elevation of Top of Riser Pipe:	1.0	441.85
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	438.85
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	10	432.85
Type of Seal:	Bentonite Chips	
Top of Filter Pack	13	429.85
Top of Screen	15	427.85
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	25	417.85
Bottom of Blank Casing:	25.25	417.60
Backfill/Seal Below Well:	25.25	417.60
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	26	416.85

DIAGRAM IS NOT TO SCALE

LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-47

Start Date: 7/29/14
Completion Date: 8/1/14
Casing Elevation: 443.03
Ground Elevation: 444.01

Coordinates
Northing: 793164.39
Easting: 2322212.17

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
					1.0			FILL	Brown, topsoil with gravel (FILL)	Air knifed to 10' bgs to clear underground utilities and obstructions.
					4.8				Becomes silty	
5					3.7			ML	Brown SILT (ML) Becomes light brown, sandy	
					1.5				Becomes brown	
					2.8					
10		24	14	1 3 5 6	1.8			SM	Loose, dry, brown, fine grained, Silty SAND (SM)	
		24	12	3 6 7 9	1.0			SP	Loose, dry, brown, fine grained SAND (SP)	
15		24	20	3 6 7 9	3.0					
		24	19	4 5 6 8	2.7					
		24	22	3 4 7 10	11.6					
20		24	18	5 5 9 9	293					
		24	20	3 6 4 5	394			ML	Loose, moist, dark gray, very fine SILT (ML), trace sand Becomes gray, sand grades out, medium stiff Becomes Clayey	Hydrocarbon like odor 22' to 25'
				4 8				CL	Soft, wet, gray, low plastic, Silty CLAY (CL)	

Completion Depth: **26.0 ft bgs**
Project No.: **21562973.19200**
Project Name: **4th Street SVE System Extension**
Drilling Contractor: **Roberts Environmental Drilling Inc.**
Drilling method: **HSA** Rig Type: **CME 75**
Drilled by: **J. Crank**
Logged by: **E. Arthur**

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.
▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic
USC based on field visual observations

URS

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LOG OF BORING AND WELL CONSTRUCTION DETAIL
SVE-47

Start Date: 7/29/14
Completion Date: 8/1/14
Casing Elevation: 443.03
Ground Elevation: 444.01

Coordinates
Northing: 793164.39
Easting: 2322212.17

Depth In feet	Well Construction	Inches Driven	Inches Recovered	Blow Counts	PID/FID (ppm)	Sampler Graphic	Symbol	USCS	DESCRIPTION	NOTES
		24	20	16 17	348			ML	Medium stiff, moist, gray, very fine Clayey SILT (ML)	
								SP	Loose, dry, light brown, fine to medium grained SAND (SP)	
									Bottom of boring at 26' bgs	

30
35
40
45

Completion Depth: 26.0 ft bgs
Project No.: 21562973.19200
Project Name: 4th Street SVE System Extension
Drilling Contractor: Roberts Environmental Drilling Inc.
Drilling method: HSA Rig Type: CME 75
Drilled by: J. Crank
Logged by: E. Arthur

Water Depth: NE ft., After NE hrs.
Water Depth: ____ ft., After ____ hrs.

▽ Water level at time of drilling
▼ Water level after drilling
ATD - At time of drilling
Splitspoon Sampler
Hollow Stem Auger-
Soil samples not collected
Geoprobe
Air Knife
Hand Auger
Sonic

USC based on field visual observations

URS

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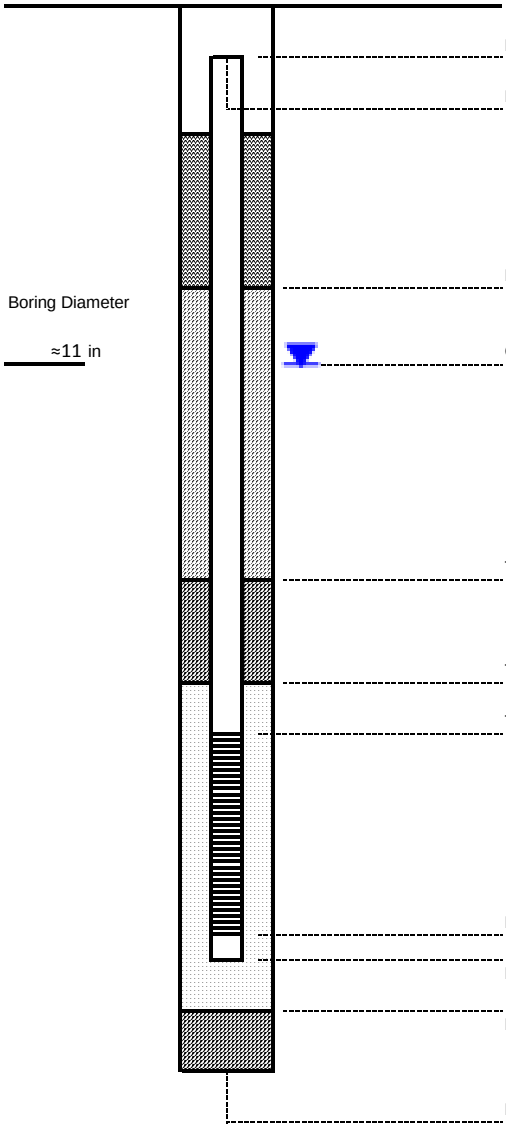
SVE Well Installation Details
Flush Mount Monitoring Well Construction Diagram

URS Corporation

Project:	4th Street SVE System Extension			Well ID:	SVE-47
Project Location:	Roxana, Illinois	Date Started:	7/29/2014		
Well Location:	147 East 4th St.	Date Completed:	8/1/2014	Boring ID:	SVE-47
Drilling Contractor:	Roberts Environmental Drilling, Inc.	Time Seal Set:	15:00 pm on 8/1/2014	Northing:	793164.39
Driller:	J. Crank	Type of Rig:	CME-75	Easting:	2322212.17
Consulting Firm:	URS Corporation	Drilling Method:	H S A	Elevation Datum:	NAVD 88
Geologist:	E. Arthur	Completion Zone:	15-25 ft bgs		



	Depths (ft bgs)	Elevations (ft)
Ground Elevation:		444.01
Depth of Riser Below Ground:	0.98	
Elevation of Top of Riser Pipe:	0.98	443.03
ID/Type of Surface Casing:	36" X 36" steel vault	
Type of Surface Seal:	Concrete	
Bottom of Surface Seal:	4	440.01
Groundwater (after completion):	N/A	N/A
Type of Riser Pipe:	Schedule 40 PVC	
Riser Diameter:	4 in	
Type of Backfill:	Cement/Bentonite Grout	
Top of Seal:	10	434.01
Type of Seal:	Bentonite Chips	
Top of Filter Pack	13	431.01
Top of Screen	15	429.01
Type of Filter Pack:	ANSI / NSF Quartz Sand	
Type of Screen:	Schedule 40 PVC	
Screen Diameter	4 in	
Screen Slot Size:	0.010 in	
Bottom of Screen:	25	419.01
Bottom of Blank Casing:	25.25	418.76
Backfill/Seal Below Well:	25.25	418.76
Type of Backfill/Seal Below Well:	Native Soil (Cave In) and placed ANSI/NSF Quartz Sand	
Bottom of Boring:	26	418.01

DIAGRAM IS NOT TO SCALE

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC32549

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 8/19/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE-47-080114 (22-24')	TB-080114 HCL
TB-080114 ST	

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

Yes

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated VOC LCS/LCSD recoveries were outside evaluation criteria. The VOC surrogate recovery of 4-bromofluorobenzene was outside evaluation criteria in sample SVE-47-080114 (22-24'). SVOC and PAH MS/MSD recoveries were outside of evaluation criteria in sample SVE-47-080114 (22-24'). Sample SVE-47-080114 (22-24') was diluted due to high levels of PAH target analytes. These issues are addressed further in the appropriate sections below. Additionally, the initial calibration verification recovery for 1,4-dioxane and acetone exceeded 30 percent difference (%D). Continuing calibration recovery for 1,2-Dibromo-3-chloropropane exceeded 15%D.

The cooler receipt form indicated samples were received by the laboratory at 1.6°C which is outside temperature criteria 4°C ± 2°C. All samples were received in good condition; no qualification of data was required.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

No

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSU965-BS/BSD	VOCs	Chloroethane	**136/135**	0	70-130/25
MSU965-BS/BSD	VOCs	1,4-Dioxane	**134**/126	7	70-130/25

Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. No qualification of data was required.

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

No

Sample ID	Parameter	Surrogate	Recovery (%)	Criteria (%)
SVE-47-080114 (22-24')	VOCs	4-Bromofluorobenzene	**1120**	70-130

Analytical data reported as non-detect and associated with surrogate recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. No qualification of data was required.

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

Yes, although not requested, sample SVE-47-080114 (22-24') was spiked and analyzed for SVOCs and PAHs.

Were MS/MSD recoveries within evaluation criteria?

No

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE-47-080114 (22-24')	SVOCs	Benzoic acid	**172/187**	9	30-130/30
SVE-47-080114 (22-24')	SVOCs	2,4-Dinitrophenol	**0/0**	NA	30-130/30
SVE-47-080114 (22-24')	SVOCs	Hexachloroethane	**183/186**	1	40-140/30
SVE-47-080114 (22-24')	PAHs	1-Methylnaphthalene	**5/23**	8	40-140/30
SVE-47-080114 (22-24')	PAHs	1-Methylnaphthalene	**-59/-29**	8	40-140/30

LCS recoveries were within evaluation criteria with the exception of compounds listed and qualified as appropriate in Section 5.0 of this data review. No further qualification of the data was required.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

Yes

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

No

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; analytes were detected in samples that were diluted.

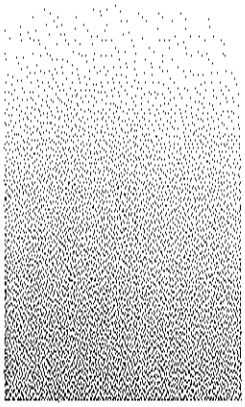
12.0 Additional Qualifications

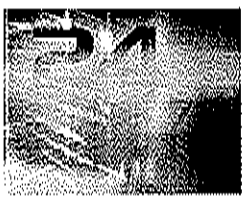
Were additional qualifications applied?

No

New England ACCUTEST LABORATORIES

08/19/14





Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

21562973.19000

Accutest Job Number: MC32549

Sampling Date: 08/01/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **85**

Reviewed on 8/19/14

Reza Tand
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

Table of Contents

Sample Summary

Shell Oil

Job No: MC32549

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19000

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC32549-1	08/01/14	15:30	08/02/14	SO	Soil	SVE47-080114 (22-24')
MC32549-2	08/01/14	00:00	08/02/14	AQ	Trip Blank Water	TB-080114 HCL
MC32549-3	08/01/14	00:00	08/02/14	AQ	Trip Blank Water	TB-080114 ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC32549
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Cent	Report Date	8/18/2014 2:43:59 PM

1 Sample(s), 2 Trip Blank were collected on 08/01/2014 and were received at Accutest on 08/02/2014 properly preserved, at 1.6 Deg. C and intact. These Samples received an Accutest job number of MC32549. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Sample Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix: AQ	Batch ID: MSU965

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32529-9MS, MC32529-9MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- MSU965-BS Recovery(s) for 1,4-Dioxane, Chloroethane are outside control limits. Blank Spike meets program technical requirements.
- MSU965-BSD Recovery(s) for Chloroethane are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2-Chloroethyl vinyl ether, 2-Hexanone, Acetone, Chloroethane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2-Chloroethyl vinyl ether, 2-Hexanone, Acetone, Chloroethane, Chloromethane, Vinyl chloride, 1,4-Dioxane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for 1,4-Dioxane are outside control limits for sample MC32529-9MSD. High RPD due to possible matrix interference and/or sample non-homogeneity.
- Initial calibration verification MSU957-ICV957 for 1,4-dioxane exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.

Matrix: SO	Batch ID: MSK2566

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32860-8MS, MC32860-8MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Matrix Spike Recovery(s) for 1,4-Dioxane, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 1,4-Dioxane, Vinyl Acetate, Acetone are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for Acetone are outside control limits for sample MC32860-8MSD. High RPD due to possible matrix interference and/or sample non-homogeneity.
- Initial calibration verification MSK2552-ICV2552 for acetone (56.8%) exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.

Extractables by GCMS By Method SW846 8270D

Matrix: SO	Batch ID: OP39254

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32549-1MS, MC32549-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- OP39254-MS/MSD Recovery(s) for 2,4-Dinitrophenol, Benzoic acid, Hexachloroethane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix: SO	Batch ID: OP39255

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32549-1MS, MC32549-1MSD were used as the QC samples indicated.
- OP39255-MS/MSD Recovery(s) for 1-Methylnaphthalene, 2-Methylnaphthalene are outside control limits. Outside control limits due to high level in sample relative to spike amount.

Volatiles by GC By Method SW846 8011

Matrix: AQ	Batch ID: OP39247

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32300-19MS, MC32300-19MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Matrix: SO	Batch ID: OP39257

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32521-1MS, MC32521-1MSD were used as the QC samples indicated.
- MC32549-1 for Bromofluorobenzene (S): Outside control limits due to possible matrix interference.
- Continuing calibration check standard GBK1299-CC1299, signal #1, file BK39971, BK39982 for 1,2-Dibromo-3-chloropropane exceed 15% Dev. 1,2-Dibromo-3-chloropropane was reported from signal #2 in associated samples.

Volatiles by GC By Method SW846 8015

Matrix: SO	Batch ID: GAB4535

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32521-1MS, MC32521-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Calibration check standard GAB4536-CC4488 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix: SO	Batch ID: GN47895

- Sample(s) MC32549-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC32549).

Summary of Hits

Job Number: MC32549
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/01/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC32549-1	SVE47-080114 (22-24')					
n-Butylbenzene		19.1	13	0.65	mg/kg	SW846 8260C
Ethylbenzene		155	5.3	1.8	mg/kg	SW846 8260C
Isopropylbenzene		13.6	13	0.45	mg/kg	SW846 8260C
Naphthalene		26.3	13	1.1	mg/kg	SW846 8260C
n-Propylbenzene		40.5	13	0.41	mg/kg	SW846 8260C
Toluene		320	13	0.55	mg/kg	SW846 8260C
1,2,4-Trimethylbenzene		179	13	3.8	mg/kg	SW846 8260C
1,3,5-Trimethylbenzene		46.1	13	4.1	mg/kg	SW846 8260C
m,p-Xylene		355	5.3	1.2	mg/kg	SW846 8260C
o-Xylene		154	5.3	0.76	mg/kg	SW846 8260C
Xylene (total)		509	5.3	0.59	mg/kg	SW846 8260C
Total TIC, Volatile		925 J			mg/kg	
Dimethyl phthalate		0.0431 J	0.31	0.018	mg/kg	SW846 8270D
Acenaphthene		0.0739	0.031	0.0053	mg/kg	SW846 8270D BY SIM
Acenaphthylene		0.0345	0.031	0.0047	mg/kg	SW846 8270D BY SIM
Anthracene		0.0240 J	0.031	0.0068	mg/kg	SW846 8270D BY SIM
Fluoranthene		0.0237 J	0.031	0.0091	mg/kg	SW846 8270D BY SIM
Fluorene		0.0947	0.031	0.0061	mg/kg	SW846 8270D BY SIM
1-Methylnaphthalene		6.65	0.061	0.0067	mg/kg	SW846 8270D BY SIM
2-Methylnaphthalene		12.1	0.061	0.0057	mg/kg	SW846 8270D BY SIM
Phenanthrene		0.112	0.031	0.0064	mg/kg	SW846 8270D BY SIM
Pyrene		0.0319	0.031	0.0095	mg/kg	SW846 8270D BY SIM
TPH-GRO (VOA)		276	19	2.8	mg/kg	SW846 8015

MC32549-2 TB-080114 HCL

No hits reported in this sample.

MC32549-3 TB-080114 ST

No hits reported in this sample.

New England ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	K81135.D	1	08/15/14	JM	n/a	n/a	MSK2566
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	5.22 g	10.0 ml	5.0 ul
Run #2			

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	27	7.5	mg/kg	
107-02-8	Acrolein	ND	67	23	mg/kg	
107-13-1	Acrylonitrile	ND	67	7.3	mg/kg	
71-43-2	Benzene	ND	1.3	0.90	mg/kg	
108-86-1	Bromobenzene	ND	13	0.67	mg/kg	
74-97-5	Bromochloromethane	ND	13	0.92	mg/kg	
75-27-4	Bromodichloromethane	ND	5.3	0.56	mg/kg	
75-25-2	Bromoform	ND	5.3	0.95	mg/kg	
74-83-9	Bromomethane	ND	5.3	1.6	mg/kg	
78-93-3	2-Butanone (MEK)	ND	27	8.2	mg/kg	
104-51-8	n-Butylbenzene	19.1	13	0.65	mg/kg	
135-98-8	sec-Butylbenzene	ND	13	2.0	mg/kg	
98-06-6	tert-Butylbenzene	ND	13	0.56	mg/kg	
75-15-0	Carbon disulfide	ND	13	0.35	mg/kg	
56-23-5	Carbon tetrachloride	ND	5.3	0.59	mg/kg	
108-90-7	Chlorobenzene	ND	5.3	0.42	mg/kg	
75-00-3	Chloroethane	ND	13	2.0	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	13	3.3	mg/kg	
67-66-3	Chloroform	ND	5.3	0.45	mg/kg	
74-87-3	Chloromethane	ND	13	1.5	mg/kg	
95-49-8	o-Chlorotoluene	ND	13	0.51	mg/kg	
106-43-4	p-Chlorotoluene	ND	13	0.71	mg/kg	
124-48-1	Dibromochloromethane	ND	5.3	0.86	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	5.3	0.57	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	5.3	0.81	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	5.3	0.92	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	5.3	2.2	mg/kg	
75-34-3	1,1-Dichloroethane	ND	5.3	0.71	mg/kg	
107-06-2	1,2-Dichloroethane	ND	5.3	0.86	mg/kg	
75-35-4	1,1-Dichloroethene	ND	5.3	1.1	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	5.3	1.2	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	5.3	1.1	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.1

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	5.3	1.1	mg/kg	
142-28-9	1,3-Dichloropropane	ND	13	0.87	mg/kg	
594-20-7	2,2-Dichloropropane	ND	13	1.5	mg/kg	
563-58-6	1,1-Dichloropropene	ND	13	0.71	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	5.3	0.61	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	5.3	0.70	mg/kg	
123-91-1	1,4-Dioxane	ND	67	54	mg/kg	
97-63-2	Ethyl methacrylate	ND	13	0.95	mg/kg	
100-41-4	Ethylbenzene	155	5.3	1.8	mg/kg	
87-68-3	Hexachlorobutadiene	ND	13	1.5	mg/kg	
591-78-6	2-Hexanone	ND	27	2.0	mg/kg	
98-82-8	Isopropylbenzene	13.6	13	0.45	mg/kg	
99-87-6	p-Isopropyltoluene	ND	13	0.47	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	5.3	0.49	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	13	1.4	mg/kg	
74-95-3	Methylene bromide	ND	13	1.2	mg/kg	
75-09-2	Methylene chloride	ND	5.3	1.4	mg/kg	
91-20-3	Naphthalene	26.3	13	1.1	mg/kg	
103-65-1	n-Propylbenzene	40.5	13	0.41	mg/kg	
100-42-5	Styrene	ND	13	0.46	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	13	1.1	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	5.3	1.1	mg/kg	
127-18-4	Tetrachloroethene	ND	5.3	0.84	mg/kg	
108-88-3	Toluene	320	13	0.55	mg/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	13	1.1	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	13	1.4	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	5.3	0.58	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	5.3	1.5	mg/kg	
79-01-6	Trichloroethene	ND	5.3	0.65	mg/kg	
75-69-4	Trichlorofluoromethane	ND	5.3	1.1	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	13	0.77	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	179	13	3.8	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	46.1	13	4.1	mg/kg	
108-05-4	Vinyl Acetate	ND	13	4.1	mg/kg	
75-01-4	Vinyl chloride	ND	5.3	2.4	mg/kg	
	m,p-Xylene	355	5.3	1.2	mg/kg	
95-47-6	o-Xylene	154	5.3	0.76	mg/kg	
1330-20-7	Xylene (total)	509	5.3	0.59	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	106%		70-130%
2037-26-5	Toluene-D8	105%		70-130%
460-00-4	4-Bromofluorobenzene	114%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
110-54-3	Hexane	7.94	54	mg/kg	JN
96-37-7	Cyclopentane, methyl-	8.63	61	mg/kg	JN
591-76-4	Hexane, 2-methyl-	9.32	49	mg/kg	JN
589-34-4	Hexane, 3-methyl-	9.51	48	mg/kg	JN
142-82-5	Heptane	9.95	49	mg/kg	JN
565-75-3	Pentane, 2,3,4-trimethyl-	11.06	60	mg/kg	JN
609-26-7	Pentane, 3-ethyl-2-methyl-	11.20	110	mg/kg	JN
111-84-2	Nonane	13.39	34	mg/kg	JN
620-14-4	Benzene, 1-ethyl-3-methyl-	14.60	130	mg/kg	JN
611-14-3	Benzene, 1-ethyl-2-methyl-	14.65	54	mg/kg	JN
	Unknown Benzene	14.93	58	mg/kg	JN
526-73-8	Benzene, 1,2,3-trimethyl-	15.63	60	mg/kg	JN
	Unknown	15.81	64	mg/kg	JN
1758-88-9	Benzene, 2-ethyl-1,4-dimethyl-	16.31	38	mg/kg	JN
934-10-1	3-Phenylbut-1-ene	17.29	56	mg/kg	JN
	Total TIC, Volatile		925	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8270D SW846 3546	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	X04240.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
Run #2							

	Initial Weight	Final Volume
Run #1	20.5 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.61	0.077	mg/kg	
95-57-8	2-Chlorophenol	ND	0.31	0.014	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.61	0.016	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.61	0.018	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.61	0.10	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.2	0.15	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.61	0.077	mg/kg	
95-48-7	2-Methylphenol	ND	0.61	0.024	mg/kg	
	3&4-Methylphenol	ND	0.61	0.030	mg/kg	
88-75-5	2-Nitrophenol	ND	0.61	0.016	mg/kg	
100-02-7	4-Nitrophenol	ND	1.2	0.12	mg/kg	
87-86-5	Pentachlorophenol	ND	0.61	0.043	mg/kg	
108-95-2	Phenol	ND	0.31	0.017	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.61	0.015	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.61	0.015	mg/kg	
62-53-3	Aniline	ND	0.61	0.031	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.31	0.016	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.31	0.013	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.61	0.031	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.31	0.017	mg/kg	
106-47-8	4-Chloroaniline	ND	0.61	0.015	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.31	0.014	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.31	0.019	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.31	0.022	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.31	0.019	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.31	0.014	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.61	0.041	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.61	0.015	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.31	0.031	mg/kg	
132-64-9	Dibenzofuran	ND	0.12	0.017	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.31	0.033	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.31	0.0096	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8270D SW846 3546	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.31	0.015	mg/kg	
131-11-3	Dimethyl phthalate	0.0431	0.31	0.018	mg/kg	J
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.31	0.011	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.31	0.019	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.61	0.15	mg/kg	
67-72-1	Hexachloroethane	ND	0.31	0.015	mg/kg	
78-59-1	Isophorone	ND	0.31	0.014	mg/kg	
88-74-4	2-Nitroaniline	ND	0.61	0.015	mg/kg	
99-09-2	3-Nitroaniline	ND	0.61	0.034	mg/kg	
100-01-6	4-Nitroaniline	ND	0.61	0.015	mg/kg	
98-95-3	Nitrobenzene	ND	0.31	0.017	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.31	0.015	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.31	0.018	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.31	0.019	mg/kg	
110-86-1	Pyridine	ND	0.61	0.031	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	67%		30-130%
4165-62-2	Phenol-d5	72%		30-130%
118-79-6	2,4,6-Tribromophenol	100%		30-130%
4165-60-0	Nitrobenzene-d5	73%		30-130%
321-60-8	2-Fluorobiphenyl	82%		30-130%
1718-51-0	Terphenyl-d14	100%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91103.D	5	08/08/14	MR	08/04/14	OP39255	MSI3392
Run #2							

	Initial Weight	Final Volume
Run #1	20.5 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	0.0739	0.031	0.0053	mg/kg	
208-96-8	Acenaphthylene	0.0345	0.031	0.0047	mg/kg	
120-12-7	Anthracene	0.0240	0.031	0.0068	mg/kg	J
56-55-3	Benzo(a)anthracene	ND	0.031	0.014	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.031	0.012	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.031	0.014	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.031	0.0083	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.031	0.0095	mg/kg	
218-01-9	Chrysene	ND	0.031	0.0083	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.031	0.0089	mg/kg	
206-44-0	Fluoranthene	0.0237	0.031	0.0091	mg/kg	J
86-73-7	Fluorene	0.0947	0.031	0.0061	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.031	0.0076	mg/kg	
90-12-0	1-Methylnaphthalene	6.65	0.061	0.0067	mg/kg	
91-57-6	2-Methylnaphthalene	12.1	0.061	0.0057	mg/kg	
85-01-8	Phenanthrene	0.112	0.031	0.0064	mg/kg	
129-00-0	Pyrene	0.0319	0.031	0.0095	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	80%		30-130%
321-60-8	2-Fluorobiphenyl	86%		30-130%
1718-51-0	Terphenyl-d14	101%		30-130%

ND = Not detected MDL = Method Detection Limit
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B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK39973.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
Run #2							

	Initial Weight	Final Volume
Run #1	30.6 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0031	0.00091	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0031	0.00076	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	92%		61-167%
460-00-4	Bromofluorobenzene (S)	1120% [a]		61-167%

(a) Outside control limits due to possible matrix interference.

ND = Not detected MDL = Method Detection Limit
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E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE47-080114 (22-24')		
Lab Sample ID:	MC32549-1	Date Sampled:	08/01/14
Matrix:	SO - Soil	Date Received:	08/02/14
Method:	SW846 8015	Percent Solids:	79.4
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85249.D	1	08/07/14	AF	n/a	n/a	GAB4535
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	3.55 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	276	19	2.8	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	96%		61-116%

ND = Not detected MDL = Method Detection Limit
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E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080114 HCL		
Lab Sample ID:	MC32549-2	Date Sampled:	08/01/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	U21778.D	1	08/13/14	GK	n/a	n/a	MSU965
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

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N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080114 HCL		
Lab Sample ID:	MC32549-2	Date Sampled:	08/01/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	0.70	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080114 HCL		
Lab Sample ID:	MC32549-2	Date Sampled:	08/01/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/02/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	123%		70-130%
2037-26-5	Toluene-D8	108%		70-130%
460-00-4	4-Bromofluorobenzene	113%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080114 ST		
Lab Sample ID:	MC32549-3	Date Sampled:	08/01/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/02/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL.: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK39946.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298
Run #2							

	Initial Volume	Final Volume
Run #1	36.5 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.014	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.014	0.0058	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	94%		36-173%
460-00-4	Bromofluorobenzene (S)	111%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

Misc. Forms

5

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody

Shell Oil Products Chain Of Custody Record

URS

LAB (LOCATION)

( ) ENCO ( )
( ) CALSCIENCE ( )
(✓) OTHER (Accutest Labs/Test Technology Ctr W Marlborough, MA 01752 (508-481-6200))
( ) Lab Vendor # 1 ( )
( ) SPL ( )

Lab Vendor #

Please Check Appropriate Box:
(✓) ENV. SERVICES ( ) MOTIVA RETAIL ( ) SHELL RETAIL
( ) MOTIVA SD&CM ( ) CONSULTANT ( ) LUBES
( ) SHELL PIPELINE ( ) OTHER ____

Print Bill To Contact Name: Rob Billman

PO #

INCIDENT # (ENV SERVICES): 9 7 2 1 4 6 4 0

SAP #: 3 4 0 0 6 1

( ) CHECK IF NO INCIDENT # APPLIES

DATE: 8/1/2014

PAGE: ___1___ of ___1___

SAMPLING COMPANY: URS CORPORATION

ADDRESS: 1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300, ST. LOUIS, MO 63110

PROJECT CONTACT (Hardcopy or PDF Report to): Elizabeth Kunkel, Rob Billman

TELEPHONE: 314-429-0100 | FAX: 314-429-0462 | E-MAIL: rob.billman@urs.com; elizabeth.kunkel@urs.com

SITE ADDRESS: Street and City: 900 South Central Ave; ROXANA | State: IL

CONSULTANT PROJECT NO.: 21562573.10000

LAB USE ONLY: MC32549

TURNAROUND TIME (CALENDAR DAYS): (✓) STANDARD (10 DAY) ( ) 5 DAYS ( ) 3 DAYS ( ) 2 DAYS ( ) 24 HOURS ( ) RESULTS NEEDED ON WEEKEND

( ) LA - RWQCB REPORT FORMAT ( ) UST AGENCY:

DELIVERABLES: ( ) LEVEL 1 (✓) LEVEL 2 ( ) LEVEL 3 ( ) LEVEL 4 (✓) OTHER (SPECIFY) EDD

TEMPERATURE ON RECEIPT C°: Cooler #1 | Cooler #2 | Cooler #3

SPECIAL INSTRUCTIONS OR NOTES :
* Please include "J" values on Reports.
* Please provide sample receipt upon login.

(✓) SHELL CONTRACT RATE APPLIES
( ) STATE REIMBURSEMENT RATE APPLIES
( ) EDD NOT NEEDED
(✓) RECEIPT VERIFICATION REQUESTED
( ) PROVIDE LDD DISK

REQUESTED ANALYSIS

LAB USE ONLY	Field Sample Identification	Sampling Date	Sampling Time	Matrix	Preservative HCL	Preservative (2)	Preservative (3)	Preservative (4)	Preservative Other	No. of Cont.	VOC 8260B SL+TICS	VOC 8011 SL	SVOC 8270C SL+TICS	PAH 8270LL	Percent Moisture	TPH-GRO	PID (ppm)	Field Notes / Container PID Readings or Laboratory Notes
1	SVE47-080114 (22-24')	8/1/2014	1530	S				2	5	7	X	X	X	X	X	X	304	
2	TB-080114 HCL			W	2					2	X							
3	TB-080114 ST			W					3	3		X						
																		IF4, 2C, 10IB
																		1.6°

Relinquished by (Signature)	Received by (Signature)	Date	Time
[signature]	FED EX	8/1/14	1900
[signature]	[signature]	8/2/14	10:00

MC32549: Chain of Custody
Page 1 of 2

ACCUTEST LABORATORIES

MC32549

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\4th Street Analytical\Data Review

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC32549 **Client:** URS **Immediate Client Services Action Required:** No

Date / Time Received: 8/2/2014 **Delivery Method:** **Client Service Action Required at Login:** No

Project: 900 SOUTH CENTRAL AVE **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y or N		Y or N
1. Custody Seals Present:	☑ ☐	3. COC Present:	☑ ☐
2. Custody Seals Intact:	☑ ☐	4. Smpl Dates/Time OK	☑ ☐

Cooler Temperature	Y or N
1. Temp criteria achieved:	☑ ☐
2. Cooler temp verification:	Infared gun
3. Cooler media:	Ice (bag)

Quality Control Preservation	Y or N	N/A
1. Trip Blank present / cooler:	☑ ☐	☐
2. Trip Blank listed on COC:	☑ ☐	☐
3. Samples preserved properly:	☑ ☐	
4. VOCs headspace free:	☑ ☐	☐

Sample Integrity - Documentation	Y or N
1. Sample labels present on bottles:	☑ ☐
2. Container labeling complete:	☑ ☐
3. Sample container label / COC agree:	☑ ☐

Sample Integrity - Condition	Y or N
1. Sample recvd within HT:	☑ ☐
2. All containers accounted for:	☑ ☐
3. Condition of sample:	Intact

Sample Integrity - Instructions	Y or N	N/A
1. Analysis requested is clear:	☑ ☐	
2. Bottles received for unspecified tests	☐ ☑	
3. Sufficient volume recvd for analysis:	☑ ☐	
4. Compositing instructions clear:	☐ ☐	☑
5. Filtering instructions clear:	☐ ☐	☑

Comments

Accutest Laboratories
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Marlborough, MA
www.accutest.com

MC32549: Chain of Custody
Page 2 of 2

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC32549

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19000

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC32549-1 Collected: 01-AUG-14 15:30 By: SVE47-080114 (22-24')		Received: 02-AUG-14 By:				
MC32549-1	SM21 2540 B MOD.	07-AUG-14	HS			%SOL
MC32549-1	SW846 8011	07-AUG-14 12:59	NK	05-AUG-14	NE	V8011SL
MC32549-1	SW846 8270D	07-AUG-14 15:49	WK	04-AUG-14	NE	AB8270SL+
MC32549-1	SW846 8015	07-AUG-14 21:32	AF			V8015GRO
MC32549-1	SW846 8270D BY SIM	08-AUG-14 12:23	MR	04-AUG-14	NE	B8270SIMSL
MC32549-1	SW846 8260C	15-AUG-14 20:31	JM			V8260SL+
MC32549-2 Collected: 01-AUG-14 00:00 By: TB-080114 HCL		Received: 02-AUG-14 By:				
MC32549-2	SW846 8260C	13-AUG-14 17:05	GK			V8260SL+
MC32549-3 Collected: 01-AUG-14 00:00 By: TB-080114 ST		Received: 02-AUG-14 By:				
MC32549-3	SW846 8011	05-AUG-14 13:09	NK	04-AUG-14	MT	V8011SL

Accutest Internal Chain of Custody

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/02/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32549-1.1	Walk In Ref #5	Aysia Wood	08/04/14 15:49	Retrieve from Storage
MC32549-1.1	Aysia Wood	Walk In Ref #5	08/04/14 20:23	Return to Storage
MC32549-1.1	Walk In Ref #5	Alireza Zeighami	08/05/14 07:52	Retrieve from Storage
MC32549-1.1	Alireza Zeighami	Walk In Ref #5	08/05/14 12:08	Return to Storage
MC32549-1.1	Walk In Ref #5	Hamid Siamak	08/07/14 11:27	Retrieve from Storage
MC32549-1.1	Hamid Siamak	Walk In Ref #5	08/07/14 14:06	Return to Storage
MC32549-1.6	VOC Ref #10	Anthony Franciosa	08/07/14 07:53	Retrieve from Storage
MC32549-1.6	Anthony Franciosa	GCAB	08/07/14 07:53	Load on Instrument
MC32549-1.6	GCAB	Anthony Franciosa	08/08/14 09:08	Unload from Instrument
MC32549-1.6	Anthony Franciosa	VOC Ref #10	08/08/14 09:08	Return to Storage
MC32549-1.7	VOC Ref #10	Krysten Dufort	08/04/14 16:31	Retrieve from Storage
MC32549-1.7	Krysten Dufort	VOC Ref #10	08/11/14 10:30	Return to Storage
MC32549-1.7	VOC Ref #10	Jaime Maslowski	08/15/14 09:35	Retrieve from Storage
MC32549-1.7	Jaime Maslowski	VOC Ref #10	08/18/14 09:53	Return to Storage
MC32549-2.2	VOC Ref #1	Gary Krasinski	08/13/14 10:24	Retrieve from Storage
MC32549-2.2	Gary Krasinski	GCMSU	08/13/14 10:24	Load on Instrument
MC32549-2.2	GCMSU	Gary Krasinski	08/14/14 08:36	Unload from Instrument
MC32549-2.2	Gary Krasinski	VOC Ref #1	08/14/14 08:36	Return to Storage
MC32549-3.1	VOC Ref #1	Marc Tahtamoni	08/04/14 14:37	Retrieve from Storage
MC32549-3.1	Marc Tahtamoni		08/06/14 14:22	Depleted

5.3

New England ACCUTEST LABORATORIES

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-MB	U21764.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	0.70	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-MB	U21764.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	1.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	1.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

5.1.1

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-MB	U21764.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	121%	70-130%
2037-26-5	Toluene-D8	106%	70-130%
460-00-4	4-Bromofluorobenzene	111%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

6.1.1

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	500	140	ug/kg	
107-02-8	Acrolein	ND	1300	440	ug/kg	
107-13-1	Acrylonitrile	ND	1300	140	ug/kg	
71-43-2	Benzene	ND	25	17	ug/kg	
108-86-1	Bromobenzene	ND	250	13	ug/kg	
74-97-5	Bromochloromethane	ND	250	17	ug/kg	
75-27-4	Bromodichloromethane	ND	100	10	ug/kg	
75-25-2	Bromoform	ND	100	18	ug/kg	
74-83-9	Bromomethane	ND	100	30	ug/kg	
78-93-3	2-Butanone (MEK)	ND	500	150	ug/kg	
104-51-8	n-Butylbenzene	ND	250	12	ug/kg	
135-98-8	sec-Butylbenzene	ND	250	37	ug/kg	
98-06-6	tert-Butylbenzene	ND	250	11	ug/kg	
75-15-0	Carbon disulfide	ND	250	6.5	ug/kg	
56-23-5	Carbon tetrachloride	ND	100	11	ug/kg	
108-90-7	Chlorobenzene	ND	100	7.9	ug/kg	
75-00-3	Chloroethane	ND	250	38	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	250	63	ug/kg	
67-66-3	Chloroform	ND	100	8.5	ug/kg	
74-87-3	Chloromethane	ND	250	28	ug/kg	
95-49-8	o-Chlorotoluene	ND	250	9.6	ug/kg	
106-43-4	p-Chlorotoluene	ND	250	13	ug/kg	
124-48-1	Dibromochloromethane	ND	100	16	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	100	11	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	100	15	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	100	17	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	100	40	ug/kg	
75-34-3	1,1-Dichloroethane	ND	100	13	ug/kg	
107-06-2	1,2-Dichloroethane	ND	100	16	ug/kg	
75-35-4	1,1-Dichloroethene	ND	100	21	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	100	23	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	100	21	ug/kg	
78-87-5	1,2-Dichloropropane	ND	100	21	ug/kg	
142-28-9	1,3-Dichloropropane	ND	250	16	ug/kg	
594-20-7	2,2-Dichloropropane	ND	250	28	ug/kg	
563-58-6	1,1-Dichloropropene	ND	250	13	ug/kg	

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	100	11	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	100	13	ug/kg	
123-91-1	1,4-Dioxane	ND	1300	1000	ug/kg	
97-63-2	Ethyl methacrylate	ND	250	18	ug/kg	
100-41-4	Ethylbenzene	ND	100	34	ug/kg	
87-68-3	Hexachlorobutadiene	ND	250	29	ug/kg	
591-78-6	2-Hexanone	ND	500	38	ug/kg	
98-82-8	Isopropylbenzene	ND	250	8.4	ug/kg	
99-87-6	p-Isopropyltoluene	ND	250	8.7	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	100	9.1	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	250	27	ug/kg	
74-95-3	Methylene bromide	ND	250	23	ug/kg	
75-09-2	Methylene chloride	ND	100	27	ug/kg	
91-20-3	Naphthalene	ND	250	20	ug/kg	
103-65-1	n-Propylbenzene	ND	250	7.6	ug/kg	
100-42-5	Styrene	ND	250	8.5	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	250	20	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	100	20	ug/kg	
127-18-4	Tetrachloroethene	ND	100	16	ug/kg	
108-88-3	Toluene	ND	250	10	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	250	21	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	250	26	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	100	11	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	100	29	ug/kg	
79-01-6	Trichloroethene	ND	100	12	ug/kg	
75-69-4	Trichlorofluoromethane	ND	100	20	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	250	14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	250	72	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	250	76	ug/kg	
108-05-4	Vinyl Acetate	ND	250	77	ug/kg	
75-01-4	Vinyl chloride	ND	100	45	ug/kg	
	m,p-Xylene	ND	100	22	ug/kg	
95-47-6	o-Xylene	ND	100	14	ug/kg	
1330-20-7	Xylene (total)	ND	100	11	ug/kg	

6.1.2

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	107%	70-130%
2037-26-5	Toluene-D8	105%	70-130%
460-00-4	4-Bromofluorobenzene	105%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

6.1.2

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
67-64-1	Acetone	2500	2960	118	70-130
107-02-8	Acrolein	12500	12700	102	70-130
107-13-1	Acrylonitrile	2500	2390	96	70-130
71-43-2	Benzene	2500	2450	98	70-130
108-86-1	Bromobenzene	2500	2630	105	70-130
74-97-5	Bromochloromethane	2500	2430	97	70-130
75-27-4	Bromodichloromethane	2500	2640	106	70-130
75-25-2	Bromoform	2500	2410	96	70-130
74-83-9	Bromomethane	2500	2470	99	70-130
78-93-3	2-Butanone (MEK)	2500	2660	106	70-130
104-51-8	n-Butylbenzene	2500	2840	114	70-130
135-98-8	sec-Butylbenzene	2500	2890	116	70-130
98-06-6	tert-Butylbenzene	2500	2900	116	70-130
75-15-0	Carbon disulfide	2500	2770	111	70-130
56-23-5	Carbon tetrachloride	2500	2770	111	70-130
108-90-7	Chlorobenzene	2500	2530	101	70-130
75-00-3	Chloroethane	2500	2950	118	70-130
110-75-8	2-Chloroethyl vinyl ether	2500	2510	100	10-160
67-66-3	Chloroform	2500	2380	95	70-130
74-87-3	Chloromethane	2500	2550	102	70-130
95-49-8	o-Chlorotoluene	2500	2580	103	70-130
106-43-4	p-Chlorotoluene	2500	2580	103	70-130
124-48-1	Dibromochloromethane	2500	2480	99	70-130
95-50-1	1,2-Dichlorobenzene	2500	2610	104	70-130
541-73-1	1,3-Dichlorobenzene	2500	2520	101	70-130
106-46-7	1,4-Dichlorobenzene	2500	2580	103	70-130
75-71-8	Dichlorodifluoromethane	2500	2940	118	70-130
75-34-3	1,1-Dichloroethane	2500	2640	106	70-130
107-06-2	1,2-Dichloroethane	2500	2410	96	70-130
75-35-4	1,1-Dichloroethene	2500	2920	117	70-130
156-59-2	cis-1,2-Dichloroethene	2500	2420	97	70-130
156-60-5	trans-1,2-Dichloroethene	2500	2580	103	70-130
78-87-5	1,2-Dichloropropane	2500	2650	106	70-130
142-28-9	1,3-Dichloropropane	2500	2490	100	70-130
594-20-7	2,2-Dichloropropane	2500	2580	103	70-130
563-58-6	1,1-Dichloropropene	2500	2710	108	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	2500	2570	103	70-130
10061-02-6	trans-1,3-Dichloropropene	2500	2700	108	70-130
123-91-1	1,4-Dioxane	6250	5270	84	70-130
97-63-2	Ethyl methacrylate	2500	2530	101	76-141
100-41-4	Ethylbenzene	2500	2560	102	70-130
87-68-3	Hexachlorobutadiene	2500	2730	109	70-130
591-78-6	2-Hexanone	2500	2410	96	70-130
98-82-8	Isopropylbenzene	2500	2920	117	70-130
99-87-6	p-Isopropyltoluene	2500	2770	111	70-130
1634-04-4	Methyl Tert Butyl Ether	2500	2430	97	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	2500	2300	92	70-130
74-95-3	Methylene bromide	2500	2480	99	70-130
75-09-2	Methylene chloride	2500	2630	105	70-130
91-20-3	Naphthalene	2500	2510	100	70-130
103-65-1	n-Propylbenzene	2500	2810	112	70-130
100-42-5	Styrene	2500	2510	100	70-130
630-20-6	1,1,1,2-Tetrachloroethane	2500	2520	101	70-130
79-34-5	1,1,2,2-Tetrachloroethane	2500	2540	102	70-130
127-18-4	Tetrachloroethene	2500	2620	105	70-130
108-88-3	Toluene	2500	2550	102	70-130
87-61-6	1,2,3-Trichlorobenzene	2500	2510	100	70-130
120-82-1	1,2,4-Trichlorobenzene	2500	2610	104	70-130
71-55-6	1,1,1-Trichloroethane	2500	2530	101	70-130
79-00-5	1,1,2-Trichloroethane	2500	2470	99	70-130
79-01-6	Trichloroethene	2500	2470	99	70-130
75-69-4	Trichlorofluoromethane	2500	2790	112	70-130
96-18-4	1,2,3-Trichloropropane	2500	2460	98	70-130
95-63-6	1,2,4-Trimethylbenzene	2500	2690	108	70-130
108-67-8	1,3,5-Trimethylbenzene	2500	2670	107	70-130
108-05-4	Vinyl Acetate	2500	1750	70	70-130
75-01-4	Vinyl chloride	2500	2600	104	70-130
	m,p-Xylene	5000	4980	100	70-130
95-47-6	o-Xylene	2500	2410	96	70-130
1330-20-7	Xylene (total)	7500	7390	99	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	103%	70-130%
2037-26-5	Toluene-D8	109%	70-130%
460-00-4	4-Bromofluorobenzene	104%	70-130%

6.2.1

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-BS	U21761.D	1	08/13/14	GK	n/a	n/a	MSU965
MSU965-BSD	U21762.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	50	42.5	85	43.2	86	2	70-130/25
107-02-8	Acrolein	250	247	99	247	99	0	70-130/25
107-13-1	Acrylonitrile	50	52.0	104	51.0	102	2	70-130/25
71-43-2	Benzene	50	52.7	105	52.0	104	1	70-130/25
108-86-1	Bromobenzene	50	53.4	107	53.5	107	0	70-130/25
74-97-5	Bromochloromethane	50	50.7	101	51.1	102	1	70-130/25
75-27-4	Bromodichloromethane	50	52.2	104	52.0	104	0	70-130/25
75-25-2	Bromoform	50	46.3	93	46.3	93	0	70-130/25
74-83-9	Bromomethane	50	55.3	111	53.5	107	3	70-130/25
78-93-3	2-Butanone (MEK)	50	48.5	97	47.2	94	3	70-130/25
104-51-8	n-Butylbenzene	50	59.1	118	58.8	118	1	70-130/25
135-98-8	sec-Butylbenzene	50	59.1	118	59.9	120	1	70-130/25
98-06-6	tert-Butylbenzene	50	50.0	100	50.3	101	1	70-130/25
75-15-0	Carbon disulfide	50	56.4	113	55.2	110	2	70-130/25
56-23-5	Carbon tetrachloride	50	46.5	93	46.2	92	1	70-130/25
108-90-7	Chlorobenzene	50	50.0	100	50.6	101	1	70-130/25
75-00-3	Chloroethane	50	67.8	136* a	67.6	135* a	0	70-130/25
110-75-8	2-Chloroethyl vinyl ether	50	59.4	119	59.2	118	0	70-130/25
67-66-3	Chloroform	50	52.9	106	51.4	103	3	70-130/25
74-87-3	Chloromethane	50	57.2	114	57.0	114	0	70-130/25
95-49-8	o-Chlorotoluene	50	54.8	110	55.5	111	1	70-130/25
106-43-4	p-Chlorotoluene	50	54.3	109	54.0	108	1	70-130/25
124-48-1	Dibromochloromethane	50	48.4	97	48.2	96	0	70-130/25
95-50-1	1,2-Dichlorobenzene	50	54.6	109	55.2	110	1	70-130/25
541-73-1	1,3-Dichlorobenzene	50	54.3	109	53.8	108	1	70-130/25
106-46-7	1,4-Dichlorobenzene	50	54.3	109	54.6	109	1	70-130/25
75-71-8	Dichlorodifluoromethane	50	53.4	107	52.4	105	2	70-130/25
75-34-3	1,1-Dichloroethane	50	55.5	111	54.9	110	1	70-130/25
107-06-2	1,2-Dichloroethane	50	46.0	92	45.9	92	0	70-130/25
75-35-4	1,1-Dichloroethene	50	54.1	108	52.2	104	4	70-130/25
156-59-2	cis-1,2-Dichloroethene	50	52.3	105	51.3	103	2	70-130/25
156-60-5	trans-1,2-Dichloroethene	50	52.3	105	50.9	102	3	70-130/25
78-87-5	1,2-Dichloropropane	50	54.4	109	54.2	108	0	70-130/25
142-28-9	1,3-Dichloropropane	50	53.3	107	53.7	107	1	70-130/25
594-20-7	2,2-Dichloropropane	50	57.3	115	53.9	108	6	70-130/25
563-58-6	1,1-Dichloropropene	50	49.7	99	48.8	98	2	70-130/25

* = Outside of Control Limits.

6.3.1

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-BS	U21761.D	1	08/13/14	GK	n/a	n/a	MSU965
MSU965-BSD	U21762.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	50	54.9	110	57.2	114	4	70-130/25
10061-02-6	trans-1,3-Dichloropropene	50	59.1	118	60.7	121	3	70-130/25
123-91-1	1,4-Dioxane	125	168	134* a	157	126	7	70-130/25
97-63-2	Ethyl methacrylate	50	54.0	108	56.2	112	4	77-137/25
100-41-4	Ethylbenzene	50	50.8	102	50.9	102	0	70-130/25
87-68-3	Hexachlorobutadiene	50	51.2	102	51.6	103	1	70-130/25
591-78-6	2-Hexanone	50	47.2	94	47.2	94	0	70-130/25
98-82-8	Isopropylbenzene	50	59.1	118	59.7	119	1	70-130/25
99-87-6	p-Isopropyltoluene	50	56.4	113	56.2	112	0	70-130/25
1634-04-4	Methyl Tert Butyl Ether	50	51.3	103	51.1	102	0	70-130/25
108-10-1	4-Methyl-2-pentanone (MIBK)	50	55.4	111	54.0	108	3	70-130/25
74-95-3	Methylene bromide	50	48.7	97	48.8	98	0	70-130/25
75-09-2	Methylene chloride	50	53.3	107	53.4	107	0	70-130/25
91-20-3	Naphthalene	50	57.3	115	57.9	116	1	70-130/25
103-65-1	n-Propylbenzene	50	59.6	119	59.7	119	0	70-130/25
100-42-5	Styrene	50	50.0	100	50.0	100	0	70-130/25
630-20-6	1,1,1,2-Tetrachloroethane	50	45.3	91	45.6	91	1	70-130/25
79-34-5	1,1,2,2-Tetrachloroethane	50	60.8	122	60.8	122	0	70-130/25
127-18-4	Tetrachloroethene	50	48.3	97	48.3	97	0	70-130/25
108-88-3	Toluene	50	54.8	110	54.9	110	0	70-130/25
87-61-6	1,2,3-Trichlorobenzene	50	54.5	109	54.6	109	0	70-130/25
120-82-1	1,2,4-Trichlorobenzene	50	53.5	107	54.8	110	2	70-130/25
71-55-6	1,1,1-Trichloroethane	50	50.5	101	49.6	99	2	70-130/25
79-00-5	1,1,2-Trichloroethane	50	56.8	114	56.7	113	0	70-130/25
79-01-6	Trichloroethene	50	49.6	99	49.4	99	0	70-130/25
75-69-4	Trichlorofluoromethane	50	47.4	95	46.0	92	3	70-130/25
96-18-4	1,2,3-Trichloropropane	50	56.9	114	57.5	115	1	70-130/25
95-63-6	1,2,4-Trimethylbenzene	50	57.3	115	57.4	115	0	70-130/25
108-67-8	1,3,5-Trimethylbenzene	50	54.7	109	55.8	112	2	70-130/25
108-05-4	Vinyl Acetate	50	47.7	95	46.6	93	2	70-130/25
75-01-4	Vinyl chloride	50	55.2	110	54.2	108	2	70-130/25
	m,p-Xylene	100	98.9	99	99.0	99	0	70-130/25
95-47-6	o-Xylene	50	48.5	97	48.8	98	1	70-130/25
1330-20-7	Xylene (total)	150	147	98	148	99	1	70-130/25

* = Outside of Control Limits.

6.3.1

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU965-BS	U21761.D	1	08/13/14	GK	n/a	n/a	MSU965
MSU965-BSD	U21762.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
1868-53-7	Dibromofluoromethane	116%	115%	70-130%
2037-26-5	Toluene-D8	117%	118%	70-130%
460-00-4	4-Bromofluorobenzene	115%	118%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32529-9MS	U21773.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9MSD	U21774.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9	U21767.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	MC32529-9 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		250	124	50* a	250	139	56* a	11	70-130/30
107-02-8	Acrolein	ND		1250	913	73	1250	1070	86	16	70-130/30
107-13-1	Acrylonitrile	ND		250	247	99	250	284	114	14	70-130/30
71-43-2	Benzene	ND		250	265	106	250	283	113	7	70-130/30
108-86-1	Bromobenzene	ND		250	246	98	250	257	103	4	70-130/30
74-97-5	Bromochloromethane	ND		250	259	104	250	278	111	7	70-130/30
75-27-4	Bromodichloromethane	ND		250	258	103	250	270	108	5	70-130/30
75-25-2	Bromoform	ND		250	199	80	250	218	87	9	70-130/30
74-83-9	Bromomethane	ND		250	270	108	250	312	125	14	70-130/30
78-93-3	2-Butanone (MEK)	ND		250	178	71	250	192	77	8	70-130/30
104-51-8	n-Butylbenzene	ND		250	275	110	250	306	122	11	70-130/30
135-98-8	sec-Butylbenzene	ND		250	284	114	250	307	123	8	70-130/30
98-06-6	tert-Butylbenzene	ND		250	244	98	250	259	104	6	70-130/30
75-15-0	Carbon disulfide	ND		250	259	104	250	292	117	12	70-130/30
56-23-5	Carbon tetrachloride	ND		250	224	90	250	251	100	11	70-130/30
108-90-7	Chlorobenzene	ND		250	244	98	250	255	102	4	70-130/30
75-00-3	Chloroethane	ND		250	343	137* a	250	376	150* a	9	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		250	24.3	10* a	250	25.3	10* a	4	70-130/30
67-66-3	Chloroform	ND		250	270	108	250	290	116	7	70-130/30
74-87-3	Chloromethane	ND		250	292	117	250	336	134* a	14	70-130/30
95-49-8	o-Chlorotoluene	ND		250	267	107	250	283	113	6	70-130/30
106-43-4	p-Chlorotoluene	ND		250	252	101	250	265	106	5	70-130/30
124-48-1	Dibromochloromethane	ND		250	221	88	250	226	90	2	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		250	260	104	250	284	114	9	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		250	254	102	250	271	108	6	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		250	258	103	250	276	110	7	70-130/30
75-71-8	Dichlorodifluoromethane	ND		250	260	104	250	304	122	16	70-130/30
75-34-3	1,1-Dichloroethane	17.2		250	296	112	250	322	122	8	70-130/30
107-06-2	1,2-Dichloroethane	ND		250	232	93	250	242	97	4	70-130/30
75-35-4	1,1-Dichloroethene	1.5		250	275	109	250	304	121	10	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		250	265	106	250	288	115	8	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		250	262	105	250	293	117	11	70-130/30
78-87-5	1,2-Dichloropropane	ND		250	270	108	250	278	111	3	70-130/30
142-28-9	1,3-Dichloropropane	ND		250	249	100	250	246	98	1	70-130/30
594-20-7	2,2-Dichloropropane	ND		250	282	113	250	304	122	8	70-130/30
563-58-6	1,1-Dichloropropene	ND		250	250	100	250	272	109	8	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32529-9MS	U21773.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9MSD	U21774.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9	U21767.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Compound	MC32529-9 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		250	253	101	250	244	98	4	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		250	252	101	250	239	96	5	70-130/30
123-91-1	1,4-Dioxane	ND		625	565	90	625	826	132* [a]	38* [b]	70-130/30
97-63-2	Ethyl methacrylate	ND		250	231	92	250	244	98	5	72-139/30
100-41-4	Ethylbenzene	ND		250	251	100	250	268	107	7	70-130/30
87-68-3	Hexachlorobutadiene	ND		250	230	92	250	268	107	15	70-130/30
591-78-6	2-Hexanone	ND		250	157	63* [a]	250	169	68* [a]	7	70-130/30
98-82-8	Isopropylbenzene	ND		250	290	116	250	309	124	6	70-130/30
99-87-6	p-Isopropyltoluene	ND		250	264	106	250	288	115	9	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		250	255	102	250	275	110	8	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		250	243	97	250	266	106	9	70-130/30
74-95-3	Methylene bromide	ND		250	248	99	250	253	101	2	70-130/30
75-09-2	Methylene chloride	ND		250	273	109	250	300	120	9	70-130/30
91-20-3	Naphthalene	ND		250	260	104	250	303	121	15	70-130/30
103-65-1	n-Propylbenzene	ND		250	285	114	250	304	122	6	70-130/30
100-42-5	Styrene	ND		250	234	94	250	250	100	7	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		250	233	93	250	256	102	9	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		250	284	114	250	304	122	7	70-130/30
127-18-4	Tetrachloroethene	ND		250	239	96	250	251	100	5	70-130/30
108-88-3	Toluene	ND		250	256	102	250	268	107	5	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		250	240	96	250	291	116	19	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		250	246	98	250	287	115	15	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		250	253	101	250	275	110	8	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		250	255	102	250	249	100	2	70-130/30
79-01-6	Trichloroethene	ND		250	251	100	250	265	106	5	70-130/30
75-69-4	Trichlorofluoromethane	ND		250	236	94	250	261	104	10	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		250	264	106	250	277	111	5	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		250	277	111	250	298	119	7	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		250	266	106	250	288	115	8	70-130/30
108-05-4	Vinyl Acetate	ND		250	246	98	250	239	96	3	70-130/30
75-01-4	Vinyl chloride	ND		250	284	114	250	327	131* [a]	14	70-130/30
	m,p-Xylene	ND		500	494	99	500	526	105	6	70-130/30
95-47-6	o-Xylene	ND		250	247	99	250	271	108	9	70-130/30
1330-20-7	Xylene (total)	ND		750	742	99	750	797	106	7	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32529-9MS	U21773.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9MSD	U21774.D	5	08/13/14	GK	n/a	n/a	MSU965
MC32529-9	U21767.D	1	08/13/14	GK	n/a	n/a	MSU965

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-2

CAS No.	Surrogate Recoveries	MS	MSD	MC32529-9	Limits
1868-53-7	Dibromofluoromethane	121%	125%	128%	70-130%
2037-26-5	Toluene-D8	113%	113%	111%	70-130%
460-00-4	4-Bromofluorobenzene	112%	110%	113%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(b) High RPD due to possible matrix interference and/or sample non-homogeneity.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	MC32860-8 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		3570	3720	104	3570	5160	144* [a]	32* [b]	70-130/30
107-02-8	Acrolein	ND		17900	18000	101	17900	17500	98	3	70-130/30
107-13-1	Acrylonitrile	ND		3570	3210	90	3570	3190	89	1	70-130/30
71-43-2	Benzene	ND		3570	3270	92	3570	3100	87	5	70-130/30
108-86-1	Bromobenzene	ND		3570	3640	102	3570	3490	98	4	70-130/30
74-97-5	Bromochloromethane	ND		3570	3290	92	3570	3230	90	2	70-130/30
75-27-4	Bromodichloromethane	ND		3570	3570	100	3570	3380	95	5	70-130/30
75-25-2	Bromoform	ND		3570	3250	91	3570	3150	88	3	70-130/30
74-83-9	Bromomethane	ND		3570	3520	98	3570	3360	94	5	70-130/30
78-93-3	2-Butanone (MEK)	ND		3570	3310	93	3570	3890	109	16	70-130/30
104-51-8	n-Butylbenzene	ND		3570	4060	114	3570	3880	109	5	70-130/30
135-98-8	sec-Butylbenzene	ND		3570	4190	117	3570	3910	109	7	70-130/30
98-06-6	tert-Butylbenzene	ND		3570	4090	114	3570	3910	109	5	70-130/30
75-15-0	Carbon disulfide	ND		3570	3680	103	3570	3490	98	5	70-130/30
56-23-5	Carbon tetrachloride	ND		3570	3850	108	3570	3560	100	8	70-130/30
108-90-7	Chlorobenzene	ND		3570	3430	96	3570	3270	92	5	70-130/30
75-00-3	Chloroethane	ND		3570	4150	116	3570	3920	110	6	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		3570	3580	100	3570	3360	94	6	10-160/30
67-66-3	Chloroform	ND		3570	3180	89	3570	3090	86	3	70-130/30
74-87-3	Chloromethane	ND		3570	3620	101	3570	3350	94	8	70-130/30
95-49-8	o-Chlorotoluene	ND		3570	3730	104	3570	3490	98	7	70-130/30
106-43-4	p-Chlorotoluene	ND		3570	3560	100	3570	3370	94	5	70-130/30
124-48-1	Dibromochloromethane	ND		3570	3310	93	3570	3220	90	3	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		3570	3570	100	3570	3380	95	5	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		3570	3580	100	3570	3370	94	6	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		3570	3560	100	3570	3450	97	3	70-130/30
75-71-8	Dichlorodifluoromethane	ND		3570	4120	115	3570	3920	110	5	70-130/30
75-34-3	1,1-Dichloroethane	ND		3570	3410	95	3570	3370	94	1	70-130/30
107-06-2	1,2-Dichloroethane	ND		3570	3270	92	3570	3110	87	5	70-130/30
75-35-4	1,1-Dichloroethene	ND		3570	3780	106	3570	3820	107	1	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		3570	3290	92	3570	3110	87	6	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		3570	3400	95	3570	3280	92	4	70-130/30
78-87-5	1,2-Dichloropropane	ND		3570	3570	100	3570	3290	92	8	70-130/30
142-28-9	1,3-Dichloropropane	ND		3570	3420	96	3570	3350	94	2	70-130/30
594-20-7	2,2-Dichloropropane	ND		3570	3500	98	3570	3350	94	4	70-130/30
563-58-6	1,1-Dichloropropene	ND		3570	3660	102	3570	3480	97	5	70-130/30

* = Outside of Control Limits.

6.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Compound	MC32860-8 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		3570	3490	98	3570	3290	92	6	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		3570	3730	104	3570	3340	93	11	70-130/30
123-91-1	1,4-Dioxane	ND		8930	24800	278* [a]	8930	24000	269* [a]	3	70-130/30
97-63-2	Ethyl methacrylate	ND		3570	3620	101	3570	3320	93	9	41-160/30
100-41-4	Ethylbenzene	ND		3570	3500	98	3570	3270	92	7	70-130/30
87-68-3	Hexachlorobutadiene	ND		3570	4420	124	3570	4330	121	2	70-130/30
591-78-6	2-Hexanone	ND		3570	3510	98	3570	3490	98	1	70-130/30
98-82-8	Isopropylbenzene	ND		3570	4130	116	3570	3920	110	5	70-130/30
99-87-6	p-Isopropyltoluene	ND		3570	3990	112	3570	3790	106	5	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		3570	3280	92	3570	3240	91	1	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		3570	3350	94	3570	3130	88	7	70-130/30
74-95-3	Methylene bromide	ND		3570	3510	98	3570	3220	90	9	70-130/30
75-09-2	Methylene chloride	ND		3570	3450	97	3570	3440	96	0	70-130/30
91-20-3	Naphthalene	ND		3570	3550	99	3570	3300	92	7	70-130/30
103-65-1	n-Propylbenzene	ND		3570	3960	111	3570	3790	106	4	70-130/30
100-42-5	Styrene	ND		3570	3360	94	3570	3200	90	5	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		3570	3300	92	3570	3210	90	3	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		3570	3670	103	3570	3560	100	3	70-130/30
127-18-4	Tetrachloroethene	ND		3570	3450	97	3570	3360	94	3	70-130/30
108-88-3	Toluene	ND		3570	3480	97	3570	3190	89	9	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		3570	3450	97	3570	3290	92	5	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		3570	3620	101	3570	3440	96	5	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		3570	3460	97	3570	3330	93	4	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		3570	3480	97	3570	3150	88	10	70-130/30
79-01-6	Trichloroethene	ND		3570	3380	95	3570	3270	92	3	70-130/30
75-69-4	Trichlorofluoromethane	ND		3570	3880	109	3570	3740	105	4	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		3570	3570	100	3570	3320	93	7	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		3570	3910	109	3570	3740	105	4	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		3570	3750	105	3570	3570	100	5	70-130/30
108-05-4	Vinyl Acetate	ND		3570	2340	65* [a]	3570	2410	67* [a]	3	70-130/30
75-01-4	Vinyl chloride	ND		3570	3550	99	3570	3360	94	5	70-130/30
	m,p-Xylene	ND		7150	6850	96	7150	6590	92	4	70-130/30
95-47-6	o-Xylene	ND		3570	3320	93	3570	3230	90	3	70-130/30
1330-20-7	Xylene (total)	ND		10700	10200	95	10700	9820	92	4	70-130/30

* = Outside of Control Limits.

6.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32549-1

CAS No.	Surrogate Recoveries	MS	MSD	MC32860-8	Limits
1868-53-7	Dibromofluoromethane	105%	105%	105%	70-130%
2037-26-5	Toluene-D8	111%	105%	99%	70-130%
460-00-4	4-Bromofluorobenzene	111%	107%	104%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(b) High RPD due to possible matrix interference and/or sample non-homogeneity.

* = Outside of Control Limits.

6.4.2

Volatile Internal Standard Area Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSK2566-CC2552	Injection Date:	08/15/14
Lab File ID:	K81110.D	Injection Time:	08:58
Instrument ID:	GCMSK	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	109976	8.78	143475	9.63	60320	12.89	79859	15.45	55188	6.42
Upper Limit [a]	219952	9.28	286950	10.13	120640	13.39	159718	15.95	110376	6.92
Lower Limit [b]	54988	8.28	71738	9.13	30160	12.39	39930	14.95	27594	5.92
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSK2566-BS	116909	8.78	148139	9.63	62180	12.89	84173	15.45	59660	6.42
MSK2566-MB	117081	8.78	153707	9.63	60071	12.89	91314	15.44	58770	6.43
ZZZZZZ	122256	8.78	151864	9.63	60366	12.89	88722	15.44	62841	6.43
MC32860-8	117065	8.78	148476	9.63	55784	12.89	83641	15.44	62164	6.42
ZZZZZZ	127258	8.78	163273	9.63	61930	12.89	91732	15.45	63931	6.43
ZZZZZZ	129569	8.79	165315	9.63	64395	12.89	94278	15.44	64494	6.42
MC32860-8MS	114017	8.78	145006	9.63	61896	12.89	79719	15.44	61045	6.42
MC32860-8MSD	118581	8.78	154847	9.63	63874	12.89	83498	15.45	61067	6.42
ZZZZZZ	117972	8.78	151316	9.63	56746	12.89	82278	15.44	62529	6.42
ZZZZZZ	115298	8.78	146423	9.63	54299	12.89	80763	15.44	61953	6.42
ZZZZZZ	116803	8.78	152723	9.63	59212	12.89	88307	15.44	65592	6.42
ZZZZZZ	123945	8.78	155163	9.63	58224	12.89	85749	15.44	64583	6.42
ZZZZZZ	118291	8.78	152693	9.63	61610	12.89	90955	15.44	59169	6.43
ZZZZZZ	120826	8.78	154744	9.63	58412	12.89	86284	15.44	66506	6.42
ZZZZZZ	120931	8.78	153691	9.63	61264	12.89	88003	15.44	66712	6.43
ZZZZZZ	120854	8.78	158272	9.63	59198	12.89	87540	15.44	63681	6.43
ZZZZZZ	122036	8.79	156355	9.63	61100	12.89	90748	15.44	64577	6.43
ZZZZZZ	123738	8.78	156796	9.63	60730	12.89	85557	15.44	64429	6.42
ZZZZZZ	124676	8.78	158360	9.63	62088	12.89	89001	15.44	60641	6.42
ZZZZZZ	118085	8.78	154869	9.63	61908	12.89	93264	15.44	62220	6.43
ZZZZZZ	114378	8.78	147237	9.63	55743	12.89	82812	15.44	61820	6.42
ZZZZZZ	110625	8.78	141381	9.63	55917	12.89	77681	15.44	60438	6.41
ZZZZZZ	111704	8.78	146447	9.63	54505	12.89	78046	15.44	62807	6.42
MC32549-1	123763	8.79	156916	9.63	62412	12.89	84570	15.44	63243	6.40

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.5.1

Volatile Internal Standard Area Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSU965-CC957	Injection Date:	08/13/14
Lab File ID:	U21761.D	Injection Time:	09:21
Instrument ID:	GCMSU	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	798697	8.97	1363396	9.84	535249	13.10	732506	15.66	299947	6.60
Upper Limit [a]	1597394	9.47	2726792	10.34	1070498	13.60	1465012	16.16	599894	7.10
Lower Limit [b]	399349	8.47	681698	9.34	267625	12.60	366253	15.16	149974	6.10
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSU965-BSD	805555	8.97	1360567	9.84	534254	13.10	721544	15.66	315124	6.62
MSU965-MB	776238	8.98	1248136	9.85	415530	13.10	680429	15.67	285649	6.63
ZZZZZZ	715072	8.98	1144819	9.85	393638	13.10	666052	15.67	293181	6.61
ZZZZZZ	709260	8.98	1122200	9.85	383899	13.10	652225	15.67	273663	6.62
MC32529-9	662847	8.98	1031449	9.85	375260	13.10	641830	15.67	306522	6.62
ZZZZZZ	706830	8.98	1164779	9.85	432978	13.10	636081	15.67	287566	6.60
ZZZZZZ	708998	8.98	1150026	9.85	417037	13.10	630377	15.67	293045	6.62
ZZZZZZ	674562	8.98	1048536	9.85	368178	13.10	627865	15.67	300855	6.62
ZZZZZZ	733980	8.98	1177125	9.85	396098	13.10	635462	15.67	262116	6.63
ZZZZZZ	721240	8.98	1156007	9.85	391668	13.10	643202	15.67	292238	6.63
MC32529-9MS	728675	8.97	1276268	9.84	469206	13.10	661901	15.66	290936	6.61
MC32529-9MSD	678695	8.97	1158199	9.84	426196	13.10	627395	15.66	308254	6.60
ZZZZZZ	692633	8.98	1132770	9.85	421829	13.10	671755	15.67	314407	6.61
ZZZZZZ	724350	8.98	1162020	9.85	407033	13.10	648686	15.67	305452	6.61
ZZZZZZ	735346	8.98	1194220	9.85	421416	13.10	638432	15.67	298064	6.61
MC32549-2	709140	8.98	1140269	9.85	387931	13.10	624690	15.67	307171	6.61
ZZZZZZ	677596	8.98	1131566	9.85	417519	13.10	613477	15.67	303922	6.62
ZZZZZZ	653116	8.98	1075225	9.85	367860	13.10	620041	15.67	287776	6.59
ZZZZZZ	675605	8.98	1075780	9.85	373632	13.10	615023	15.67	277097	6.61
ZZZZZZ	687631	8.98	1111572	9.85	376837	13.10	628748	15.66	286893	6.61
ZZZZZZ	725783	8.98	1186949	9.84	397294	13.10	651881	15.66	295033	6.62
ZZZZZZ	732304	8.98	1208421	9.85	445603	13.10	636190	15.67	282660	6.60
ZZZZZZ	701219	8.98	1175381	9.85	410918	13.10	640367	15.66	355966	6.62

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32549-2	U21778.D	123	108	113
MC32529-9MS	U21773.D	121	113	112
MC32529-9MSD	U21774.D	125	113	110
MSU965-BS	U21761.D	116	117	115
MSU965-BSD	U21762.D	115	118	118
MSU965-MB	U21764.D	121	106	111

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

9.6.1

Volatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32549-1	K81135.D	106	105	114
MC32860-8MS	K81118.D	105	111	111
MC32860-8MSD	K81119.D	105	105	107
MSK2566-BS	K81111.D	103	109	104
MSK2566-MB	K81113.D	107	105	105

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.6.2

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-MB	X04235.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	490	61	ug/kg	
95-57-8	2-Chlorophenol	ND	240	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	490	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	490	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	490	80	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	980	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	490	61	ug/kg	
95-48-7	2-Methylphenol	ND	490	19	ug/kg	
	3&4-Methylphenol	ND	490	24	ug/kg	
88-75-5	2-Nitrophenol	ND	490	13	ug/kg	
100-02-7	4-Nitrophenol	ND	980	92	ug/kg	
87-86-5	Pentachlorophenol	ND	490	34	ug/kg	
108-95-2	Phenol	ND	240	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	490	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	490	12	ug/kg	
62-53-3	Aniline	ND	490	24	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	240	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	240	10	ug/kg	
100-51-6	Benzyl Alcohol	ND	490	25	ug/kg	
91-58-7	2-Chloronaphthalene	ND	240	13	ug/kg	
106-47-8	4-Chloroaniline	ND	490	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	240	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	240	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	240	18	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	240	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	240	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	490	33	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	490	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	240	24	ug/kg	
132-64-9	Dibenzofuran	ND	98	14	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	240	26	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	240	7.6	ug/kg	
84-66-2	Diethyl phthalate	ND	240	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	240	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	240	9.0	ug/kg	
118-74-1	Hexachlorobenzene	ND	240	15	ug/kg	

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-MB	X04235.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	490	120	ug/kg	
67-72-1	Hexachloroethane	ND	240	12	ug/kg	
78-59-1	Isophorone	ND	240	11	ug/kg	
88-74-4	2-Nitroaniline	ND	490	12	ug/kg	
99-09-2	3-Nitroaniline	ND	490	27	ug/kg	
100-01-6	4-Nitroaniline	ND	490	12	ug/kg	
98-95-3	Nitrobenzene	ND	240	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	240	12	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	240	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	240	15	ug/kg	
110-86-1	Pyridine	ND	490	24	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	68%	30-130%
4165-62-2	Phenol-d5	72%	30-130%
118-79-6	2,4,6-Tribromophenol	89%	30-130%
4165-60-0	Nitrobenzene-d5	73%	30-130%
321-60-8	2-Fluorobiphenyl	74%	30-130%
1718-51-0	Terphenyl-d14	93%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39255-MB	I91093.D	1	08/08/14	MR	08/04/14	OP39255	MSI3392

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32549-1

7.1.2

7

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.9	0.85	ug/kg	
208-96-8	Acenaphthylene	ND	4.9	0.74	ug/kg	
120-12-7	Anthracene	ND	4.9	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.9	2.2	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.9	1.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.9	2.2	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.9	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.9	1.5	ug/kg	
218-01-9	Chrysene	ND	4.9	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.9	1.4	ug/kg	
206-44-0	Fluoranthene	ND	4.9	1.4	ug/kg	
86-73-7	Fluorene	ND	4.9	0.96	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.9	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	ND	9.8	1.1	ug/kg	
91-57-6	2-Methylnaphthalene	ND	9.8	0.91	ug/kg	
85-01-8	Phenanthrene	ND	4.9	1.0	ug/kg	
129-00-0	Pyrene	ND	4.9	1.5	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	37%	15-110%
4165-62-2	Phenol-d5	36%	15-110%
118-79-6	2,4,6-Tribromophenol	34%	15-110%
4165-60-0	Nitrobenzene-d5	75%	30-130%
321-60-8	2-Fluorobiphenyl	70%	30-130%
1718-51-0	Terphenyl-d14	96%	30-130%

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39255-BS	I91094.D	1	08/08/14	MR	08/04/14	OP39255	MSI3392

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2490	2040	82	40-140
208-96-8	Acenaphthylene	2490	1850	74	40-140
120-12-7	Anthracene	2490	2160	87	40-140
56-55-3	Benzo(a)anthracene	2490	2750	111	40-140
50-32-8	Benzo(a)pyrene	2490	2370	95	40-140
205-99-2	Benzo(b)fluoranthene	2490	2980	120	40-140
191-24-2	Benzo(g,h,i)perylene	2490	2480	100	40-140
207-08-9	Benzo(k)fluoranthene	2490	2270	91	40-140
218-01-9	Chrysene	2490	2290	92	40-140
53-70-3	Dibenzo(a,h)anthracene	2490	2650	107	40-140
206-44-0	Fluoranthene	2490	2510	101	40-140
86-73-7	Fluorene	2490	2050	82	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2490	2580	104	40-140
90-12-0	1-Methylnaphthalene	2490	1960	79	40-140
91-57-6	2-Methylnaphthalene	2490	2000	80	40-140
85-01-8	Phenanthrene	2490	2150	86	40-140
129-00-0	Pyrene	2490	2490	100	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	37%	15-110%
4165-62-2	Phenol-d5	36%	15-110%
118-79-6	2,4,6-Tribromophenol	42%	15-110%
4165-60-0	Nitrobenzene-d5	76%	30-130%
321-60-8	2-Fluorobiphenyl	73%	30-130%
1718-51-0	Terphenyl-d14	93%	30-130%

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-BS	X04236.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
OP39254-BSD	X04237.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	2490	1090	44	1140	46	4	30-130/30
95-57-8	2-Chlorophenol	2490	1880	76	2020	82	7	30-130/30
59-50-7	4-Chloro-3-methyl phenol	2490	2240	90	2230	90	0	30-130/30
120-83-2	2,4-Dichlorophenol	2490	1980	80	2080	84	5	30-130/30
105-67-9	2,4-Dimethylphenol	2490	2040	82	2090	85	2	30-130/30
51-28-5	2,4-Dinitrophenol	2490	1070	43	1110	45	4	30-130/30
534-52-1	4,6-Dinitro-o-cresol	2490	1900	76	1920	78	1	30-130/30
95-48-7	2-Methylphenol	2490	1770	71	1920	78	8	30-130/30
	3&4-Methylphenol	4980	3750	75	3910	79	4	30-130/30
88-75-5	2-Nitrophenol	2490	1950	78	2080	84	6	30-130/30
100-02-7	4-Nitrophenol	2490	1670	67	1820	74	9	30-130/30
87-86-5	Pentachlorophenol	2490	1820	73	1900	77	4	30-130/30
108-95-2	Phenol	2490	1970	79	2050	83	4	30-130/30
95-95-4	2,4,5-Trichlorophenol	2490	2040	82	2150	87	5	30-130/30
88-06-2	2,4,6-Trichlorophenol	2490	2030	82	2190	89	8	30-130/30
62-53-3	Aniline	2490	1340	54	1380	56	3	40-140/30
101-55-3	4-Bromophenyl phenyl ether	2490	2630	106	2780	113	6	40-140/30
85-68-7	Butyl benzyl phthalate	2490	2380	96	2500	101	5	40-140/30
100-51-6	Benzyl Alcohol	2490	1590	64	1810	73	13	40-140/30
91-58-7	2-Chloronaphthalene	2490	2200	88	2360	96	7	40-140/30
106-47-8	4-Chloroaniline	2490	1810	73	1900	77	5	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	2490	2090	84	2170	88	4	40-140/30
111-44-4	bis(2-Chloroethyl)ether	2490	1940	78	2060	83	6	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	2490	1820	73	1920	78	5	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	2490	2330	94	2490	101	7	40-140/30
122-66-7	1,2-Diphenylhydrazine	2490	2390	96	2520	102	5	40-140/30
121-14-2	2,4-Dinitrotoluene	2490	2440	98	2550	103	4	40-140/30
606-20-2	2,6-Dinitrotoluene	2490	2450	98	2600	105	6	40-140/30
91-94-1	3,3'-Dichlorobenzidine	2490	2400	96	2480	100	3	40-140/30
132-64-9	Dibenzofuran	2490	2000	80	2130	86	6	40-140/30
84-74-2	Di-n-butyl phthalate	2490	2260	91	2370	96	5	40-140/30
117-84-0	Di-n-octyl phthalate	2490	2460	99	2540	103	3	40-140/30
84-66-2	Diethyl phthalate	2490	2310	93	2440	99	5	40-140/30
131-11-3	Dimethyl phthalate	2490	2330	94	2500	101	7	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	2490	2600	105	2760	112	6	40-140/30
118-74-1	Hexachlorobenzene	2490	2780	112	2920	118	5	40-140/30

* = Outside of Control Limits.

7.3.1

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-BS	X04236.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
OP39254-BSD	X04237.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	2490	1500	60	1620	66	8	40-140/30
67-72-1	Hexachloroethane	2490	1930	78	2030	82	5	40-140/30
78-59-1	Isophorone	2490	1980	80	2050	83	3	40-140/30
88-74-4	2-Nitroaniline	2490	2320	93	2480	100	7	40-140/30
99-09-2	3-Nitroaniline	2490	2140	86	2270	92	6	40-140/30
100-01-6	4-Nitroaniline	2490	2040	82	2040	83	0	40-140/30
98-95-3	Nitrobenzene	2490	2110	85	2200	89	4	40-140/30
62-75-9	n-Nitrosodimethylamine	2490	1800	72	1920	78	6	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	2490	2120	85	2190	89	3	40-140/30
86-30-6	N-Nitrosodiphenylamine	2490	2170	87	2260	91	4	40-140/30
110-86-1	Pyridine	2490	1450	58	1510	61	4	40-140/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
367-12-4	2-Fluorophenol	67%	69%	30-130%
4165-62-2	Phenol-d5	72%	76%	30-130%
118-79-6	2,4,6-Tribromophenol	97%	101%	30-130%
4165-60-0	Nitrobenzene-d5	76%	80%	30-130%
321-60-8	2-Fluorobiphenyl	77%	83%	30-130%
1718-51-0	Terphenyl-d14	89%	94%	30-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-MS	X04238.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
OP39254-MSD	X04239.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
MC32549-1	X04240.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	MC32549-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		3050	5240	172* a	3060	5720	187* a	9	30-130/30
95-57-8	2-Chlorophenol	ND		3050	2120	70	3060	2240	73	6	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		3050	2500	82	3060	2610	85	4	30-130/30
120-83-2	2,4-Dichlorophenol	ND		3050	2510	82	3060	2700	88	7	30-130/30
105-67-9	2,4-Dimethylphenol	ND		3050	2280	75	3060	2630	86	14	30-130/30
51-28-5	2,4-Dinitrophenol	ND		3050	ND	0* a	3060	ND	0* a	nc	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		3050	989	32	3060	1230	40	22	30-130/30
95-48-7	2-Methylphenol	ND		3050	2150	71	3060	2400	79	11	30-130/30
	3&4-Methylphenol	ND		6090	4660	76	6110	5060	83	8	30-130/30
88-75-5	2-Nitrophenol	ND		3050	2250	74	3060	2570	84	13	30-130/30
100-02-7	4-Nitrophenol	ND		3050	2140	70	3060	2200	72	3	30-130/30
87-86-5	Pentachlorophenol	ND		3050	1990	65	3060	2150	70	8	30-130/30
108-95-2	Phenol	ND		3050	2270	75	3060	2350	77	3	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		3050	2460	81	3060	2630	86	7	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		3050	2460	81	3060	2580	84	5	30-130/30
62-53-3	Aniline	ND		3050	1600	53	3060	1660	54	4	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		3050	3030	99	3060	3390	111	11	40-140/30
85-68-7	Butyl benzyl phthalate	ND		3050	2760	91	3060	3070	100	11	40-140/30
100-51-6	Benzyl Alcohol	ND		3050	1950	64	3060	2140	70	9	40-140/30
91-58-7	2-Chloronaphthalene	ND		3050	2620	86	3060	2790	91	6	40-140/30
106-47-8	4-Chloroaniline	ND		3050	2220	73	3060	2430	80	9	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		3050	2350	77	3060	2930	96	22	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		3050	2410	79	3060	2870	94	17	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		3050	1790	59	3060	1950	64	9	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		3050	2810	92	3060	3010	99	7	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		3050	2700	89	3060	3030	99	12	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		3050	2960	97	3060	3080	101	4	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		3050	2910	96	3060	3110	102	7	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		3050	2740	90	3060	2990	98	9	40-140/30
132-64-9	Dibenzofuran	ND		3050	2420	79	3060	2580	84	6	40-140/30
84-74-2	Di-n-butyl phthalate	ND		3050	2700	89	3060	2850	93	5	40-140/30
117-84-0	Di-n-octyl phthalate	ND		3050	2990	98	3060	3190	104	6	40-140/30
84-66-2	Diethyl phthalate	ND		3050	2720	89	3060	2890	95	6	40-140/30
131-11-3	Dimethyl phthalate	43.1	J	3050	2830	91	3060	3000	97	6	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		3050	3090	101	3060	3320	109	7	40-140/30
118-74-1	Hexachlorobenzene	ND		3050	3230	106	3060	3530	116	9	40-140/30

* = Outside of Control Limits.

7.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39254-MS	X04238.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
OP39254-MSD	X04239.D	1	08/07/14	WK	08/04/14	OP39254	MSX139
MC32549-1	X04240.D	1	08/07/14	WK	08/04/14	OP39254	MSX139

The QC reported here applies to the following samples: Method: SW846 8270D

MC32549-1

CAS No.	Compound	MC32549-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		3050	1600	53	3060	1790	59	11	40-140/30
67-72-1	Hexachloroethane	ND		3050	5590	183* [a]	3060	5670	186* [a]	1	40-140/30
78-59-1	Isophorone	ND		3050	2310	76	3060	2560	84	10	40-140/30
88-74-4	2-Nitroaniline	ND		3050	2760	91	3060	2990	98	8	40-140/30
99-09-2	3-Nitroaniline	ND		3050	2560	84	3060	2620	86	2	40-140/30
100-01-6	4-Nitroaniline	ND		3050	2350	77	3060	2410	79	3	40-140/30
98-95-3	Nitrobenzene	ND		3050	2360	77	3060	3150	103	29	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		3050	1880	62	3060	2000	65	6	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		3050	2610	86	3060	2870	94	9	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		3050	2670	88	3060	2840	93	6	40-140/30
110-86-1	Pyridine	ND		3050	1750	57	3060	1890	62	8	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32549-1	Limits
367-12-4	2-Fluorophenol	72%	77%	67%	30-130%
4165-62-2	Phenol-d5	61%	67%	72%	30-130%
118-79-6	2,4,6-Tribromophenol	94%	101%	100%	30-130%
4165-60-0	Nitrobenzene-d5	67%	75%	73%	30-130%
321-60-8	2-Fluorobiphenyl	74%	79%	82%	30-130%
1718-51-0	Terphenyl-d14	85%	91%	100%	30-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39255-MS	I91101.D	5	08/08/14	MR	08/04/14	OP39255	MSI3392
OP39255-MSD	I91102.D	5	08/08/14	MR	08/04/14	OP39255	MSI3392
MC32549-1	I91103.D	5	08/08/14	MR	08/04/14	OP39255	MSI3392

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32549-1

7.4.2

CAS No.	Compound	MC32549-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	73.9		3050	2920	93	3060	3040	97	4	40-140/30
208-96-8	Acenaphthylene	34.5		3050	2640	86	3060	2770	90	5	40-140/30
120-12-7	Anthracene	24.0	J	3050	2990	97	3060	3160	103	6	40-140/30
56-55-3	Benzo(a)anthracene	ND		3050	3440	113	3060	3640	119	6	40-140/30
50-32-8	Benzo(a)pyrene	ND		3050	2990	98	3060	3140	103	5	40-140/30
205-99-2	Benzo(b)fluoranthene	ND		3050	3830	126	3060	4000	131	4	40-140/30
191-24-2	Benzo(g,h,i)perylene	ND		3050	3200	105	3060	3340	109	4	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		3050	3020	99	3060	3190	104	5	40-140/30
218-01-9	Chrysene	ND		3050	2940	97	3060	3150	103	7	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		3050	3400	112	3060	3560	117	5	40-140/30
206-44-0	Fluoranthene	23.7	J	3050	3490	114	3060	3690	120	6	40-140/30
86-73-7	Fluorene	94.7		3050	2970	94	3060	3100	98	4	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		3050	3320	109	3060	3490	114	5	40-140/30
90-12-0	1-Methylnaphthalene	6650		3050	6800	5* [a]	3060	7340	23* [a]	8	40-140/30
91-57-6	2-Methylnaphthalene	12100		3050	10300	-59* [a]	3060	11200	-29* [a]	8	40-140/30
85-01-8	Phenanthrene	112		3050	3150	100	3060	3300	104	5	40-140/30
129-00-0	Pyrene	31.9		3050	3400	111	3060	3620	117	6	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32549-1	Limits
367-12-4	2-Fluorophenol	31%	32%		15-110%
4165-62-2	Phenol-d5	37%	38%		15-110%
118-79-6	2,4,6-Tribromophenol	41%	43%		15-110%
4165-60-0	Nitrobenzene-d5	71%	80%	80%	30-130%
321-60-8	2-Fluorobiphenyl	81%	85%	86%	30-130%
1718-51-0	Terphenyl-d14	95%	101%	101%	30-130%

(a) Outside control limits due to high level in sample relative to spike amount.

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3392-CC3386	Injection Date:	08/08/14
Lab File ID:	I91092.D	Injection Time:	08:08
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	511280	4.17	1099682	5.23	564987	6.76	944981	8.16	621193	10.93	1588995	12.43
Upper Limit [a]	1022560	4.67	2199364	5.73	1129974	7.26	1889962	8.66	1242386	11.43	3177990	12.93
Lower Limit [b]	255640	3.67	549841	4.73	282494	6.26	472491	7.66	310597	10.43	794498	11.93
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39255-MB	642747	4.17	1409110	5.22	712875	6.76	1152340	8.16	726483	10.93	1838594	12.43
OP39255-BS	640486	4.17	1382468	5.23	690720	6.76	1110255	8.16	713723	10.93	1743358	12.43
ZZZZZZ	637271	4.17	1407726	5.22	712496	6.76	1131219	8.16	689913	10.93	1726250	12.43
ZZZZZZ	553045	4.17	1213971	5.22	610689	6.76	974670	8.16	590785	10.93	1474503	12.42
ZZZZZZ	608545	4.17	1326787	5.23	671521	6.76	1081142	8.16	696628	10.93	1783504	12.43
OP39255-MS	508820	4.18	1098216	5.23	556813	6.76	901496	8.16	579829	10.93	1459164	12.43
OP39255-MSD	505056	4.18	1086017	5.23	555177	6.76	892975	8.16	572096	10.93	1457065	12.43
MC32549-1	506820	4.18	1089212	5.23	565469	6.76	901944	8.16	571243	10.93	1460953	12.42
OP39280-MB	597422	4.17	1300626	5.22	648785	6.76	1026827	8.16	672554	10.93	1704803	12.43
OP39280-BS	593393	4.17	1272944	5.23	621749	6.76	989964	8.16	654811	10.93	1655784	12.43
OP39280-MS	537251	4.17	1161892	5.23	570701	6.76	908648	8.16	587658	10.93	1504148	12.43
OP39280-MSD	603048	4.17	1307056	5.23	639628	6.76	1027093	8.16	662804	10.93	1687516	12.43
MC32300-23	581325	4.17	1265301	5.23	637052	6.76	1017012	8.16	648564	10.93	1678393	12.43
ZZZZZZ	605624	4.17	1319849	5.22	659451	6.76	1046431	8.16	661496	10.93	1715659	12.43
ZZZZZZ	561533	4.17	1207991	5.22	602540	6.76	968663	8.16	610833	10.93	1582934	12.42

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.1

Semivolatile Internal Standard Area Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSX139-CC106	Injection Date:	08/07/14
Lab File ID:	X04218.D	Injection Time:	08:18
Instrument ID:	GCMSX	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	343389	3.30	1275761	4.34	691210	5.84	1051262	7.11	851782	9.48	683586	11.01
Upper Limit [a]	686778	3.80	2551522	4.84	1382420	6.34	2102524	7.61	1703564	9.98	1367172	11.51
Lower Limit [b]	171695	2.80	637881	3.84	345605	5.34	525631	6.61	425891	8.98	341793	10.51
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39265-MB	325141	3.30	1175361	4.33	641120	5.84	954239	7.11	711790	9.48	531707	11.01
OP39265-BS	314518	3.30	1144561	4.34	612476	5.84	936109	7.11	745252	9.48	627265	11.00
OP39265-MS	302478	3.30	1113255	4.33	597035	5.84	904639	7.11	716253	9.48	596684	11.00
OP39265-MSD	286827	3.30	1060872	4.33	581082	5.84	889017	7.11	712748	9.48	597668	11.00
MC32562-1	277321	3.30	1026802	4.33	568195	5.84	863007	7.10	666564	9.47	509644	10.99
ZZZZZZ	314818	3.30	1135749	4.33	610287	5.84	896090	7.10	673308	9.47	539165	11.00
ZZZZZZ	299200	3.30	1071285	4.33	586363	5.84	871353	7.10	664696	9.47	552864	10.99
ZZZZZZ	313365	3.30	1106344	4.33	607279	5.84	899669	7.10	708723	9.47	581603	11.00
ZZZZZZ	314585	3.30	1140855	4.33	633492	5.84	954275	7.10	738698	9.47	581512	11.00
ZZZZZZ	290446	3.30	1056629	4.33	588481	5.84	899137	7.10	699351	9.47	565645	11.00
ZZZZZZ	321015	3.30	1183351	4.33	662385	5.84	973033	7.10	732872	9.47	534968	11.00
ZZZZZZ	296214	3.30	1096684	4.33	600726	5.84	937039	7.10	706151	9.47	576630	11.00
ZZZZZZ	282295	3.30	1046407	4.33	577694	5.84	884778	7.10	693910	9.48	568562	11.00
ZZZZZZ	282194	3.30	1030268	4.33	567284	5.84	892747	7.10	714533	9.48	597884	11.00
ZZZZZZ	265274	3.30	980967	4.33	534190	5.84	844432	7.10	690657	9.47	558944	11.00
OP39254-MB	321059	3.30	1164688	4.33	618180	5.84	886022	7.10	631983	9.47	488253	11.00
OP39254-BS	309272	3.30	1116421	4.33	597378	5.84	896786	7.11	681554	9.48	608467	11.00
OP39254-BSD	306306	3.30	1109186	4.33	573392	5.84	857403	7.11	658395	9.48	602971	11.00
OP39254-MS	272365	3.31	978346	4.34	547044	5.84	825786	7.11	643991	9.48	567948	11.00
OP39254-MSD	305325	3.31	1078018	4.34	602970	5.84	878652	7.11	657914	9.48	575692	11.00
MC32549-1	296743	3.32	1070384	4.35	600860	5.84	860158	7.10	585113	9.47	456758	11.00
ZZZZZZ	301982	3.30	1073848	4.33	560018	5.84	820195	7.10	599533	9.47	506253	10.99
ZZZZZZ	288741	3.30	1006666	4.33	538320	5.84	779884	7.10	585104	9.47	497669	10.99
ZZZZZZ	331473	3.30	1173816	4.33	615862	5.84	877892	7.10	670293	9.48	599424	11.00
ZZZZZZ	273228	3.30	956464	4.33	506180	5.84	739470	7.10	555555	9.47	500076	10.99
ZZZZZZ	282700	3.30	1004261	4.33	534064	5.84	778503	7.10	575343	9.47	479481	10.99
ZZZZZZ	317679	3.30	1134765	4.33	580973	5.84	837514	7.10	605320	9.47	475339	10.99
ZZZZZZ	279875	3.30	999429	4.33	530975	5.84	770163	7.10	577009	9.47	500486	10.99
ZZZZZZ	273010	3.30	964240	4.33	516312	5.84	741302	7.10	551090	9.47	457987	10.99
ZZZZZZ	234893	3.30	847418	4.33	461610	5.84	689999	7.10	583463	9.47	510914	10.99
ZZZZZZ	230281	3.30	841769	4.33	463048	5.84	729368	7.10	601544	9.47	487443	11.00
ZZZZZZ	240862	3.30	864265	4.33	470045	5.84	720155	7.10	589626	9.47	527637	11.00
ZZZZZZ	279621	3.30	986502	4.33	530651	5.84	769075	7.10	603192	9.47	524193	10.99

IS 1 = 1,4-Dichlorobenzene-d4

7.5.2

7

Semivolatile Internal Standard Area Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSX139-CC106	Injection Date:	08/07/14
Lab File ID:	X04218.D	Injection Time:	08:18
Instrument ID:	GCMSX	Method:	SW846 8270D

Lab Sample ID	IS 1 AREA	IS 1 RT	IS 2 AREA	IS 2 RT	IS 3 AREA	IS 3 RT	IS 4 AREA	IS 4 RT	IS 5 AREA	IS 5 RT	IS 6 AREA	IS 6 RT

IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.2

Semivolatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC32549-1	X04240.D	67	72	100	73	82	100
OP39254-BS	X04236.D	67	72	97	76	77	89
OP39254-BSD	X04237.D	69	76	101	80	83	94
OP39254-MB	X04235.D	68	72	89	73	74	93
OP39254-MS	X04238.D	72	61	94	67	74	85
OP39254-MSD	X04239.D	77	67	101	75	79	91

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.6.1

Semivolatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32549-1	I91103.D	80	86	101
OP39255-BS	I91094.D	76	73	93
OP39255-MB	I91093.D	75	70	96
OP39255-MS	I91101.D	71	81	95
OP39255-MSD	I91102.D	80	85	101

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

7.6.2

New England ACCUTEST LABORATORIES

GC Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-MB	BK39938.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-3

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	115%	36-173%
460-00-4	Bromofluorobenzene (S)	107%	36-173%

8.1.1

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-MB	BK39961.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.72	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.60	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	158%	61-167%
460-00-4	Bromofluorobenzene (S)	163%	61-167%

8.1.2

Method Blank Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-MB	AB85228.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32549-1

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	95%	61-116%

8.1.3

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-BS	BK39939.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.085	120	60-140
106-93-4	1,2-Dibromoethane	0.071	0.083	117	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	110%	36-173%
460-00-4	Bromofluorobenzene (S)	118%	36-173%

8.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-BS	BK39962.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	33.1	37.1	112	59-142
106-93-4	1,2-Dibromoethane	33.1	28.4	86	56-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	135%	61-167%
460-00-4	Bromofluorobenzene (S)	123%	61-167%

8.2.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-BSP	AB85229.D	1	08/07/14	AF	n/a	n/a	GAB4535
GAB4535-BSD	AB85230.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32549-1

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	32.0	98	31.9	98	0	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	98%	97%	61-116%

8.3.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-MS	BK39940.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298
OP39247-MSD	BK39941.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298
MC32300-19	BK39942.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-3

CAS No.	Compound	MC32300-19 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.087	123	0.071	0.084	118	4	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.082	115	0.071	0.078	110	5	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32300-19	Limits
460-00-4	Bromofluorobenzene (S)	89%	88%	92%	36-173%
460-00-4	Bromofluorobenzene (S)	100%	104%	106%	36-173%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-MS	BK39963.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
OP39257-MSD	BK39964.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
MC32521-1	BK39965.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32549-1

CAS No.	Compound	MC32521-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		37.4	58.5	156	37.7	57.7	153	1	40-156/27
106-93-4	1,2-Dibromoethane	ND		37.4	46.9	125	37.7	48.5	129	3	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32521-1	Limits
460-00-4	Bromofluorobenzene (S)	159%	162%	155%	61-167%
460-00-4	Bromofluorobenzene (S)	152%	158%	155%	61-167%

8.4.2

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32521-1MS	AB85233.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1MSD	AB85234.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1	AB85232.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32549-1

CAS No.	Compound	MC32521-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	ND		94.1	94.9	101	94.1	95.1	101	0	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC32521-1	Limits
	2,3,4-Trifluorotoluene	101%	100%	98%	61-116%

8.4.3

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32549-3	BK39946.D	94	111
OP39247-BS	BK39939.D	110	118
OP39247-MB	BK39938.D	115	107
OP39247-MS	BK39940.D	89	100
OP39247-MSD	BK39941.D	88	104

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32549-1	BK39973.D	92	1120* [c]
OP39257-BS	BK39962.D	135	123
OP39257-MB	BK39961.D	158	163
OP39257-MS	BK39963.D	159	152
OP39257-MSD	BK39964.D	162	158

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1
(c) Outside control limits due to possible matrix interference.

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC32549-1	AB85249.D	96
GAB4535-BSD	AB85230.D	97
GAB4535-BSP	AB85229.D	98
GAB4535-MB	AB85228.D	95
MC32521-1MS	AB85233.D	101
MC32521-1MSD	AB85234.D	100

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.3

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1298-ICC1298	Injection Date:	08/05/14
Lab File ID:	BK39934.D	Injection Time:	09:17
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.36	4.38

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39247-MB	BK39938.D	08/05/14	10:34	4.36	4.38
OP39247-BS	BK39939.D	08/05/14	10:54	4.36	4.38
OP39247-MS	BK39940.D	08/05/14	11:13	4.36	4.38
OP39247-MSD	BK39941.D	08/05/14	11:32	4.36	4.38
MC32300-19	BK39942.D	08/05/14	11:52	4.36	4.38
ZZZZZZ	BK39943.D	08/05/14	12:11	4.36	4.37
ZZZZZZ	BK39944.D	08/05/14	12:30	4.36	4.38
ZZZZZZ	BK39945.D	08/05/14	12:49	4.36	4.38
MC32549-3	BK39946.D	08/05/14	13:09	4.36	4.38
ZZZZZZ	BK39947.D	08/05/14	13:28	4.36	4.38

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1299-CC1299	Injection Date:	08/07/14
Lab File ID:	BK39960.D	Injection Time:	08:31
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.27	4.29

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39257-MB	BK39961.D	08/07/14	09:07	4.27	4.28
OP39257-BS	BK39962.D	08/07/14	09:26	4.27	4.28
OP39257-MS	BK39963.D	08/07/14	09:46	4.27	4.28
OP39257-MSD	BK39964.D	08/07/14	10:05	4.27	4.28
MC32521-1	BK39965.D	08/07/14	10:24	4.27	4.28
ZZZZZZ	BK39966.D	08/07/14	10:44	4.27	4.28
ZZZZZZ	BK39967.D	08/07/14	11:03	4.26	4.28
ZZZZZZ	BK39968.D	08/07/14	11:22	4.27	4.28
ZZZZZZ	BK39969.D	08/07/14	11:42	4.27	4.28
ZZZZZZ	BK39970.D	08/07/14	12:01	4.27	4.28

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	CBK1299-CC1299	Injection Date:	08/07/14
Lab File ID:	BK39971.D	Injection Time:	12:21
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.27	4.28

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
ZZZZZZ	BK39972.D	08/07/14	12:40	4.27	4.28
MC32549-1	BK39973.D	08/07/14	12:59	4.27	4.30
ZZZZZZ	BK39974.D	08/07/14	13:19	4.27	4.28
ZZZZZZ	BK39975.D	08/07/14	13:38	4.27	4.28
ZZZZZZ	BK39976.D	08/07/14	13:58	4.27	4.28
ZZZZZZ	BK39977.D	08/07/14	14:17	4.27	4.28
ZZZZZZ	BK39978.D	08/07/14	14:36	4.27	4.28
ZZZZZZ	BK39979.D	08/07/14	14:56	4.27	4.28
ZZZZZZ	BK39980.D	08/07/14	15:15	4.27	4.28
ZZZZZZ	BK39981.D	08/07/14	15:34	4.27	4.28

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227A.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.5

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85248A.D	Injection Time:	20:54
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
MC32549-1	AB85249.D	08/07/14	21:32	20.32
ZZZZZZ	AB85250.D	08/07/14	22:09	20.32
ZZZZZZ	AB85251.D	08/07/14	22:46	20.32
ZZZZZZ	AB85252.D	08/07/14	23:23	20.32
ZZZZZZ	AB85253.D	08/08/14	00:00	20.32
ZZZZZZ	AB85254.D	08/08/14	00:37	20.32
ZZZZZZ	AB85255.D	08/08/14	01:14	20.32
ZZZZZZ	AB85256.D	08/08/14	01:51	20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

GC Surrogate Retention Time Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85248.D	Injection Time:	20:54
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
MC32549-1	AB85249.D	08/07/14	21:32	20.32
ZZZZZZ	AB85250.D	08/07/14	22:09	20.32
ZZZZZZ	AB85251.D	08/07/14	22:46	20.32
ZZZZZZ	AB85252.D	08/07/14	23:23	20.32
ZZZZZZ	AB85253.D	08/08/14	00:00	20.32
ZZZZZZ	AB85254.D	08/08/14	00:37	20.32
ZZZZZZ	AB85255.D	08/08/14	01:14	20.32
ZZZZZZ	AB85256.D	08/08/14	01:51	20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.7

8

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General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC32549
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC32549-1 Analyzed: 07-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE47-080114 (22-24')

Wet Weight (Total)	39.646	g
Tare Weight	23.896	g
Dry Weight (Total)	36.398	g
Solids, Percent	79.4	%

9.1

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC32591

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 9/3/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE-46-080414 (18-22')	SVE-46-080414 (18-22')-Dup
TB-080414-HCL	TB-080414-ST

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

Yes

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated analytes were detected in the method blanks. VOC and SVOC LCS recoveries were outside evaluation criteria. The SVOC surrogate recovery for nitrobenzene-d_5 was outside evaluation criteria in sample SVE-46-080414 (18-22'). SVOC and PAH MS/MSD recoveries were outside of evaluation criteria in sample SVE-46-080414 (18-22'). Additionally, the initial calibration verification recovery for 1,4-dioxane exceeded 30 percent difference (%D). Continuing calibration recovery for 1,4-dioxane exceeded 40%D, and 1,2-dibromo-3-chloropropane exceeded 15%D.

The cooler receipt form indicated samples were received by the laboratory at 0.9°C which is outside temperature criteria 4°C ± 2°C. All samples were received in good condition; no qualification of data was required.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

Yes

Blank ID	Parameter	Analyte	Concentration/ Amount
MSM2392-MB	VOCs	Acetone	0.0109 mg/L
OP39279-MB	PAHs	Fluoranthene	0.0025 mg/L
OP39279-MB	PAHs	Phenanthrene	0.0018 mg/L
OP39279-MB	PAHs	Pyrene	0.0023 mg/L

Qualifications due to blank contamination are included in the table below. Analytical data that were reported non-detect or at concentrations greater than five times (5X) the associated blank concentration did not require qualification.

Sample ID	Parameter	Analyte	New Reporting Limit (RL)	Qualification
SVE-46-080414 (18-22')	PAHs	Phenanthrene	-	**U**

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSU964-BS	VOCs	Acrolein	**67**	NA	70-130
MSU964-BS	VOCs	Chloroethane	**131**	NA	70-130
MSU964-BS	VOCs	1,4-Dioxane	**149**	NA	70-130
MSM2392-BS	VOCs	1,4-Dioxane	**141**	NA	70-130
OP39278-BS	SVOCs	Hexachlorocyclopentadiene	**38**	NA	40-140

Analytical data that required qualification based on LCS/LCSD data are included in the table below. Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. LCS MSU964-BS is associated with the trip blank; blanks are quality control samples and are not qualified.

Sample ID	Parameter	Analyte	Qualification
SVE-46-080414 (18-22')	SVOCs	Hexachlorocyclopentadiene	**UJ**
SVE-46-080414 (18-22')-Dup	SVOCs	Hexachlorocyclopentadiene	**UJ**

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

No

Sample ID	Parameter	Surrogate	Recovery (%)	Criteria (%)
SVE-46-080414 (18-22')-Run#1	SVOCs	Nitrobenzene-d_5	**25**	30-130
SVE-46-080414 (18-22')-Run#2	SVOCs	Nitrobenzene-d_5	**25**	30-130

Analytical data reported as non-detect and associated with surrogate recoveries above evaluation criteria, indicating a possible high bias, did not require qualification.

Sample ID	Parameter	Analyte	Qualification
SVE-46-080414 (18-22')	SVOCs	All non-detects	**UJ**

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

Yes, although not requested, sample SVE-46-080414 (18-22') was spiked and analyzed for SVOCs and PAHs.

Were MS/MSD recoveries within evaluation criteria?

No

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE-46-080414 (18-22')	SVOCs	Benzoic acid	45/72	**47**	30-130/30
SVE-46-080414 (18-22')	SVOCs	2,4-Dinitrophenol	**21**/31	**37**	30-130/30
SVE-46-080414 (18-22')	SVOCs	Hexachlorocyclopentadiene	**24/30**	22	40-140/30

USEPA National Functional Guidelines for Organic Data Review indicates that organic data does not require qualification based on MS/MSD data alone and LCS recoveries were within evaluation criteria with the exception of compounds listed and qualified as appropriate in Section 5.0 of this data review. No further qualification of the data was required.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

Yes

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

Yes

Field ID	Field Duplicate ID
SVE-46-080414 (18-22')	SVE-46-080414 (18-22')-Dup

Were field duplicates within evaluation criteria?

Yes

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; samples analyzed did not require dilution.

12.0 Additional Qualifications

Were additional qualifications applied?

No

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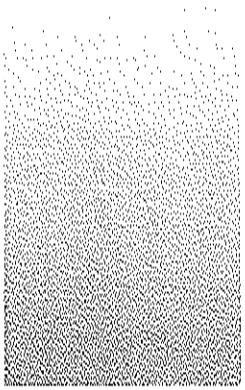
08/22/14



Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

21562973.19200

Accutest Job Number: MC32591

Sampling Date: 08/04/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **97**

Reviewed on 9/3/2014

Reza Pand
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

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Sample Summary

Shell Oil

Job No: MC32591

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC32591-1	08/04/14	13:30	08/05/14	SO	Soil	SVE46-080414(18-22')
MC32591-2	08/04/14	13:30	08/05/14	SO	Soil	SVE46-080414(18-22')DUP
MC32591-3	08/04/14	00:00	08/05/14	AQ	Trip Blank Water	TB-080414-HCL
MC32591-4	08/04/14	00:00	08/05/14	AQ	Trip Blank Water	TB-080414-ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

ACCUTEST LABORATORIES

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SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC32591
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Centr	Report Date	8/19/2014 12:50:24 PM

2 Sample(s) and 2 Trip Blank(s) were collected on 08/04/2014 and were received at Accutest on 08/05/2014 properly preserved, at 0.9 Deg. C and intact. These Samples received an Accutest job number of MC32591. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Sample Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix AQ	Batch ID: MSU964

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32593-2AMS, MC32593-2AMSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- MSU964-BS Recovery(s) for Acrolein are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2-Chloroethyl vinyl ether, 2-Hexanone, Acetone, Acrolein, Chloroethane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2-Chloroethyl vinyl ether, 2-Hexanone, Acetone, Acrolein are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- MSU964-BS for Chloroethane,1,4-Dioxane: Outside control limits. Associated samples are non-detect for this compound.
- Continuing calibration check standard MSU964-CC957 for 1,4-dioxane exceeds 40% Difference (response bias high). Associated sample is non-detect for this compound.
- Initial calibration verification MSU957-ICV957 for 1,4-dioxane exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.

Matrix SO	Batch ID: MSM2392

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32787-1MS, MC32787-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Blank Spike Recovery(s) for 1,4-Dioxane are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2-Chloroethyl vinyl ether, 4-Methyl-2-pentanone (MIBK), Acetone, Acrolein, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2-Chloroethyl vinyl ether, Acetone, Acrolein, 1,1-Dichloropropene, 1,2,4-Trichlorobenzene, Hexachlorobutadiene, Styrene, Tetrachloroethene, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for 1,1,1,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,1-Dichloropropene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,2,4-Trimethylbenzene, 1,2-Dichlorobenzene, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,3,5-Trimethylbenzene, 1,3-Dichlorobenzene, 1,3-Dichloropropane, 1,4-Dichlorobenzene, 2,2-Dichloropropane, Acrylonitrile, Benzene, Bromobenzene, Bromochloromethane, Bromodichloromethane, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chloroform, cis-1,2-Dichloroethene, cis-1,3-Dichloropropene, Dibromochloromethane, Ethyl methacrylate, Ethylbenzene, Hexachlorobutadiene, Isopropylbenzene, m,p-Xylene, Methyl Tert Butyl Ether, Methylene bromide, Methylene chloride, n-Butylbenzene, n-Propylbenzene, Naphthalene, o-Chlorotoluene, o-Xylene, p-Chlorotoluene, p-Isopropyltoluene, sec-Butylbenzene, Styrene, tert-Butylbenzene, Tetrachloroethene, Toluene, trans-1,2-Dichloroethene, trans-1,3-Dichloropropene, Trichloroethene, Vinyl Acetate, Xylene (total) are outside control limits for sample MC32787-1MSD. High RPD due to possible matrix interference and/or sample non-homogeneity.
- Continuing calibration check standard MSM2392-CC2378 for 1,4-dioxane exceeds 40% Difference (response bias high). Associated sample is non-detect for this compound.

Extractables by GCMS By Method SW846 8270D

Matrix SO	Batch ID: OP39278

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32591-1MS, MC32591-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- OP39278-BS/MS/MSD Recovery(s) for Hexachlorocyclopentadiene are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2,4-Dinitrophenol are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for 2,4-Dinitrophenol, Benzoic acid are outside control limits for sample OP39278-MSD. High RPD due to possible matrix interference and/or sample heterogeneity.
- MC32591-1: Confirmation run for surrogate recoveries.
- MC32591-1 for Nitrobenzene-d5: Outside control limits due to possible matrix interference. Confirmed by reanalysis.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix SO	Batch ID: OP39279

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32591-1MS, MC32591-1MSD were used as the QC samples indicated.
- MC32591-1 has compound(s) reported with a "B" qualifier, indicating analyte is found in the associated method blank.

Volatiles by GC By Method SW846 8011

Matrix AQ	Batch ID: OP39247

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32300-19MS, MC32300-19MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Matrix SO	Batch ID: OP39257

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32521-1MS, MC32521-1MSD were used as the QC samples indicated.
- Continuing calibration check standard GBK1299-CC1299, signal #1, file BK39971, BK39982, BK39986 for 1,2-Dibromo-3-chloropropane exceed 15% Dev. 1,2-Dibromo-3-chloropropane was reported from signal #2 in associated samples.

Volatiles by GC By Method SW846 8015

Matrix SO	Batch ID: GAB4535

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32521-1MS, MC32521-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Calibration check standard GAB4536-CC4488 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix SO	Batch ID: GN47895

- Sample(s) MC32549-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC32591).

Summary of Hits

Job Number: MC32591
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/04/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC32591-1	SVE46-080414(18-22')					
Benzene		0.0010	0.00059	0.00040	mg/kg	SW846 8260C
Ethylbenzene		0.0020 J	0.0024	0.00082	mg/kg	SW846 8260C
Toluene		0.0025 J	0.0059	0.00024	mg/kg	SW846 8260C
m,p-Xylene		0.00094 J	0.0024	0.00052	mg/kg	SW846 8260C
o-Xylene		0.00043 J	0.0024	0.00034	mg/kg	SW846 8260C
Xylene (total)		0.0014 J	0.0024	0.00026	mg/kg	SW846 8260C
Benzo(g,h,i)perylene		0.0031 J	0.0050	0.0014	mg/kg	SW846 8270D BY SIM
Phenanthrene		~~0.0016~~ JB	0.0050	0.0010	mg/kg	SW846 8270D BY SIM
MC32591-2	SVE46-080414(18-22')DUP					
Benzene		0.00083	0.00059	0.00040	mg/kg	SW846 8260C
Ethylbenzene		0.0016 J	0.0024	0.00081	mg/kg	SW846 8260C
Toluene		0.0022 J	0.0059	0.00024	mg/kg	SW846 8260C
m,p-Xylene		0.00081 J	0.0024	0.00052	mg/kg	SW846 8260C
Xylene (total)		0.0011 J	0.0024	0.00026	mg/kg	SW846 8260C
MC32591-3	TB-080414-HCL					
No hits reported in this sample.						
MC32591-4	TB-080414-ST					
No hits reported in this sample.						

New England ACCUTEST LABORATORIES

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	M67622.D	1	08/14/14	KD	n/a	n/a	MSM2392
Run #2							

	Initial Weight	Final Volume
Run #1	4.40 g	5.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	0.012	0.0033	mg/kg	
107-02-8	Acrolein	ND	0.030	0.010	mg/kg	
107-13-1	Acrylonitrile	ND	0.030	0.0033	mg/kg	
71-43-2	Benzene	0.0010	0.00059	0.00040	mg/kg	
108-86-1	Bromobenzene	ND	0.0059	0.00030	mg/kg	
74-97-5	Bromochloromethane	ND	0.0059	0.00041	mg/kg	
75-27-4	Bromodichloromethane	ND	0.0024	0.00025	mg/kg	
75-25-2	Bromoform	ND	0.0024	0.00042	mg/kg	
74-83-9	Bromomethane	ND	0.0024	0.00071	mg/kg	
78-93-3	2-Butanone (MEK)	ND	0.012	0.0036	mg/kg	
104-51-8	n-Butylbenzene	ND	0.0059	0.00029	mg/kg	
135-98-8	sec-Butylbenzene	ND	0.0059	0.00089	mg/kg	
98-06-6	tert-Butylbenzene	ND	0.0059	0.00025	mg/kg	
75-15-0	Carbon disulfide	ND	0.0059	0.00016	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.0024	0.00026	mg/kg	
108-90-7	Chlorobenzene	ND	0.0024	0.00019	mg/kg	
75-00-3	Chloroethane	ND	0.0059	0.00090	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.0059	0.0015	mg/kg	
67-66-3	Chloroform	ND	0.0024	0.00020	mg/kg	
74-87-3	Chloromethane	ND	0.0059	0.00067	mg/kg	
95-49-8	o-Chlorotoluene	ND	0.0059	0.00023	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.0059	0.00032	mg/kg	
124-48-1	Dibromochloromethane	ND	0.0024	0.00038	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.0024	0.00025	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.0024	0.00036	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.0024	0.00041	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.0024	0.00096	mg/kg	
75-34-3	1,1-Dichloroethane	ND	0.0024	0.00032	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.0024	0.00038	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.0024	0.00049	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.0024	0.00054	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.0024	0.00050	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.0024	0.00050	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.0059	0.00039	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.0059	0.00067	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.0059	0.00031	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.0024	0.00027	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.0024	0.00031	mg/kg	
123-91-1	1,4-Dioxane	ND	0.030	0.024	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.0059	0.00042	mg/kg	
100-41-4	Ethylbenzene	0.0020	0.0024	0.00082	mg/kg	J
87-68-3	Hexachlorobutadiene	ND	0.0059	0.00068	mg/kg	
591-78-6	2-Hexanone	ND	0.012	0.00090	mg/kg	
98-82-8	Isopropylbenzene	ND	0.0059	0.00020	mg/kg	
99-87-6	p-Isopropyltoluene	ND	0.0059	0.00021	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.0024	0.00022	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.0059	0.00064	mg/kg	
74-95-3	Methylene bromide	ND	0.0059	0.00054	mg/kg	
75-09-2	Methylene chloride	ND	0.0024	0.00063	mg/kg	
91-20-3	Naphthalene	ND	0.0059	0.00047	mg/kg	
103-65-1	n-Propylbenzene	ND	0.0059	0.00018	mg/kg	
100-42-5	Styrene	ND	0.0059	0.00020	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.0059	0.00048	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.0024	0.00047	mg/kg	
127-18-4	Tetrachloroethene	ND	0.0024	0.00037	mg/kg	
108-88-3	Toluene	0.0025	0.0059	0.00024	mg/kg	J
87-61-6	1,2,3-Trichlorobenzene	ND	0.0059	0.00051	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.0059	0.00061	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.0024	0.00026	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.0024	0.00068	mg/kg	
79-01-6	Trichloroethene	ND	0.0024	0.00029	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.0024	0.00047	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.0059	0.00034	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	0.0059	0.0017	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	0.0059	0.0018	mg/kg	
108-05-4	Vinyl Acetate	ND	0.0059	0.0018	mg/kg	
75-01-4	Vinyl chloride	ND	0.0024	0.0011	mg/kg	
	m,p-Xylene	0.00094	0.0024	0.00052	mg/kg	J
95-47-6	o-Xylene	0.00043	0.0024	0.00034	mg/kg	J
1330-20-7	Xylene (total)	0.0014	0.0024	0.00026	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	98%		70-130%
2037-26-5	Toluene-D8	90%		70-130%
460-00-4	4-Bromofluorobenzene	85%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D SW846 3546	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75252.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
Run #2 [a]	F75277.D	1	08/12/14	WK	08/06/14	OP39278	MSF3312

	Initial Weight	Final Volume
Run #1	20.8 g	1.0 ml
Run #2	20.8 g	1.0 ml

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.50	0.063	mg/kg	UJ
95-57-8	2-Chlorophenol	ND	0.25	0.011	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.50	0.013	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.50	0.014	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.50	0.082	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.0	0.13	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.50	0.063	mg/kg	
95-48-7	2-Methylphenol	ND	0.50	0.020	mg/kg	
	3&4-Methylphenol	ND	0.50	0.024	mg/kg	
88-75-5	2-Nitrophenol	ND	0.50	0.013	mg/kg	
100-02-7	4-Nitrophenol	ND	1.0	0.094	mg/kg	
87-86-5	Pentachlorophenol	ND	0.50	0.035	mg/kg	
108-95-2	Phenol	ND	0.25	0.014	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.50	0.013	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.50	0.012	mg/kg	
62-53-3	Aniline	ND	0.50	0.025	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.25	0.013	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.25	0.010	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.50	0.025	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.25	0.014	mg/kg	
106-47-8	4-Chloroaniline	ND	0.50	0.013	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.25	0.012	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.25	0.015	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.25	0.018	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.25	0.015	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.25	0.011	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.50	0.033	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.50	0.013	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.25	0.025	mg/kg	
132-64-9	Dibenzofuran	ND	0.10	0.014	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.25	0.027	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.25	0.0078	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D SW846 3546	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.25	0.013	mg/kg	UJ
131-11-3	Dimethyl phthalate	ND	0.25	0.014	mg/kg	↓
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.25	0.0093	mg/kg	↓
118-74-1	Hexachlorobenzene	ND	0.25	0.016	mg/kg	↓
77-47-4	Hexachlorocyclopentadiene	ND	0.50	0.13	mg/kg	UJ
67-72-1	Hexachloroethane	ND	0.25	0.012	mg/kg	↓
78-59-1	Isophorone	ND	0.25	0.012	mg/kg	↓
88-74-4	2-Nitroaniline	ND	0.50	0.013	mg/kg	↓
99-09-2	3-Nitroaniline	ND	0.50	0.027	mg/kg	↓
100-01-6	4-Nitroaniline	ND	0.50	0.013	mg/kg	↓
98-95-3	Nitrobenzene	ND	0.25	0.014	mg/kg	↓
62-75-9	n-Nitrosodimethylamine	ND	0.25	0.012	mg/kg	↓
621-64-7	N-Nitroso-di-n-propylamine	ND	0.25	0.014	mg/kg	↓
86-30-6	N-Nitrosodiphenylamine	ND	0.25	0.015	mg/kg	↓
110-86-1	Pyridine	ND	0.50	0.025	mg/kg	↓

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	32%	32%	30-130%
4165-62-2	Phenol-d5	33%	32%	30-130%
118-79-6	2,4,6-Tribromophenol	62%	60%	30-130%
4165-60-0	Nitrobenzene-d5	25% [b]	25% [b]	30-130%
321-60-8	2-Fluorobiphenyl	34%	31%	30-130%
1718-51-0	Terphenyl-d14	70%	68%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

(a) Confirmation run for surrogate recoveries.
(b) Outside control limits due to possible matrix interference. Confirmed by reanalysis.

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91144.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393
Run #2							

	Initial Weight	Final Volume
Run #1	20.8 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.0050	0.00087	mg/kg	
208-96-8	Acenaphthylene	ND	0.0050	0.00076	mg/kg	
120-12-7	Anthracene	ND	0.0050	0.0011	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.0050	0.0023	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.0050	0.0020	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.0050	0.0022	mg/kg	
191-24-2	Benzo(g,h,i)perylene	0.0031	0.0050	0.0014	mg/kg	J
207-08-9	Benzo(k)fluoranthene	ND	0.0050	0.0015	mg/kg	
218-01-9	Chrysene	ND	0.0050	0.0014	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0050	0.0014	mg/kg	
206-44-0	Fluoranthene	ND	0.0050	0.0015	mg/kg	
86-73-7	Fluorene	ND	0.0050	0.00099	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0050	0.0012	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.010	0.0011	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.010	0.00093	mg/kg	
85-01-8	Phenanthrene	0.0016	0.0050	0.0010	mg/kg	JB
129-00-0	Pyrene	ND	0.0050	0.0016	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	32%		30-130%
321-60-8	2-Fluorobiphenyl	35%		30-130%
1718-51-0	Terphenyl-d14	82%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK39984.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
Run #2							

	Initial Weight	Final Volume
Run #1	30.4 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0026	0.00076	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0026	0.00063	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	105%		61-167%
460-00-4	Bromofluorobenzene (S)	141%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')		
Lab Sample ID:	MC32591-1	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8015	Percent Solids:	95.7
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85246.D	1	08/07/14	AF	n/a	n/a	GAB4535
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.16 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	13	1.9	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	94%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	M67623.D	1	08/14/14	KD	n/a	n/a	MSM2392
Run #2							

	Initial Weight	Final Volume
Run #1	4.41 g	5.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	0.012	0.0033	mg/kg	
107-02-8	Acrolein	ND	0.030	0.010	mg/kg	
107-13-1	Acrylonitrile	ND	0.030	0.0032	mg/kg	
71-43-2	Benzene	0.00083	0.00059	0.00040	mg/kg	
108-86-1	Bromobenzene	ND	0.0059	0.00030	mg/kg	
74-97-5	Bromochloromethane	ND	0.0059	0.00041	mg/kg	
75-27-4	Bromodichloromethane	ND	0.0024	0.00025	mg/kg	
75-25-2	Bromoform	ND	0.0024	0.00042	mg/kg	
74-83-9	Bromomethane	ND	0.0024	0.00071	mg/kg	
78-93-3	2-Butanone (MEK)	ND	0.012	0.0036	mg/kg	
104-51-8	n-Butylbenzene	ND	0.0059	0.00029	mg/kg	
135-98-8	sec-Butylbenzene	ND	0.0059	0.00088	mg/kg	
98-06-6	tert-Butylbenzene	ND	0.0059	0.00025	mg/kg	
75-15-0	Carbon disulfide	ND	0.0059	0.00015	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.0024	0.00026	mg/kg	
108-90-7	Chlorobenzene	ND	0.0024	0.00019	mg/kg	
75-00-3	Chloroethane	ND	0.0059	0.00089	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.0059	0.0015	mg/kg	
67-66-3	Chloroform	ND	0.0024	0.00020	mg/kg	
74-87-3	Chloromethane	ND	0.0059	0.00067	mg/kg	
95-49-8	o-Chlorotoluene	ND	0.0059	0.00023	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.0059	0.00031	mg/kg	
124-48-1	Dibromochloromethane	ND	0.0024	0.00038	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.0024	0.00025	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.0024	0.00036	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.0024	0.00041	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.0024	0.00096	mg/kg	
75-34-3	1,1-Dichloroethane	ND	0.0024	0.00032	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.0024	0.00038	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.0024	0.00049	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.0024	0.00053	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.0024	0.00049	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.0024	0.00050	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.0059	0.00039	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.0059	0.00067	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.0059	0.00031	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.0024	0.00027	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.0024	0.00031	mg/kg	
123-91-1	1,4-Dioxane	ND	0.030	0.024	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.0059	0.00042	mg/kg	
100-41-4	Ethylbenzene	0.0016	0.0024	0.00081	mg/kg	J
87-68-3	Hexachlorobutadiene	ND	0.0059	0.00068	mg/kg	
591-78-6	2-Hexanone	ND	0.012	0.00089	mg/kg	
98-82-8	Isopropylbenzene	ND	0.0059	0.00020	mg/kg	
99-87-6	p-Isopropyltoluene	ND	0.0059	0.00021	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.0024	0.00022	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.0059	0.00064	mg/kg	
74-95-3	Methylene bromide	ND	0.0059	0.00054	mg/kg	
75-09-2	Methylene chloride	ND	0.0024	0.00063	mg/kg	
91-20-3	Naphthalene	ND	0.0059	0.00047	mg/kg	
103-65-1	n-Propylbenzene	ND	0.0059	0.00018	mg/kg	
100-42-5	Styrene	ND	0.0059	0.00020	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.0059	0.00047	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.0024	0.00046	mg/kg	
127-18-4	Tetrachloroethene	ND	0.0024	0.00037	mg/kg	
108-88-3	Toluene	0.0022	0.0059	0.00024	mg/kg	J
87-61-6	1,2,3-Trichlorobenzene	ND	0.0059	0.00050	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.0059	0.00060	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.0024	0.00026	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.0024	0.00068	mg/kg	
79-01-6	Trichloroethene	ND	0.0024	0.00029	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.0024	0.00047	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.0059	0.00034	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	0.0059	0.0017	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	0.0059	0.0018	mg/kg	
108-05-4	Vinyl Acetate	ND	0.0059	0.0018	mg/kg	
75-01-4	Vinyl chloride	ND	0.0024	0.0011	mg/kg	
	m,p-Xylene	0.00081	0.0024	0.00052	mg/kg	J
95-47-6	o-Xylene	ND	0.0024	0.00033	mg/kg	
1330-20-7	Xylene (total)	0.0011	0.0024	0.00026	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	100%		70-130%
2037-26-5	Toluene-D8	92%		70-130%
460-00-4	4-Bromofluorobenzene	85%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D SW846 3546	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75253.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
Run #2							

	Initial Weight	Final Volume
Run #1	21.0 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.50	0.062	mg/kg	
95-57-8	2-Chlorophenol	ND	0.25	0.011	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.50	0.013	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.50	0.014	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.50	0.081	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	0.99	0.12	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.50	0.062	mg/kg	
95-48-7	2-Methylphenol	ND	0.50	0.020	mg/kg	
	3&4-Methylphenol	ND	0.50	0.024	mg/kg	
88-75-5	2-Nitrophenol	ND	0.50	0.013	mg/kg	
100-02-7	4-Nitrophenol	ND	0.99	0.093	mg/kg	
87-86-5	Pentachlorophenol	ND	0.50	0.035	mg/kg	
108-95-2	Phenol	ND	0.25	0.014	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.50	0.012	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.50	0.012	mg/kg	
62-53-3	Aniline	ND	0.50	0.025	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.25	0.013	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.25	0.010	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.50	0.025	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.25	0.013	mg/kg	
106-47-8	4-Chloroaniline	ND	0.50	0.012	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.25	0.012	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.25	0.015	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.25	0.018	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.25	0.015	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.25	0.011	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.50	0.033	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.50	0.012	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.25	0.025	mg/kg	
132-64-9	Dibenzofuran	ND	0.099	0.014	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.25	0.026	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.25	0.0078	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D SW846 3546	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.2.4

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.25	0.012	mg/kg	
131-11-3	Dimethyl phthalate	ND	0.25	0.014	mg/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.25	0.0092	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.25	0.016	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.50	0.12	mg/kg	UJ
67-72-1	Hexachloroethane	ND	0.25	0.012	mg/kg	
78-59-1	Isophorone	ND	0.25	0.011	mg/kg	
88-74-4	2-Nitroaniline	ND	0.50	0.012	mg/kg	
99-09-2	3-Nitroaniline	ND	0.50	0.027	mg/kg	
100-01-6	4-Nitroaniline	ND	0.50	0.012	mg/kg	
98-95-3	Nitrobenzene	ND	0.25	0.013	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.25	0.012	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.25	0.014	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.25	0.015	mg/kg	
110-86-1	Pyridine	ND	0.50	0.025	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	69%		30-130%
4165-62-2	Phenol-d5	67%		30-130%
118-79-6	2,4,6-Tribromophenol	78%		30-130%
4165-60-0	Nitrobenzene-d5	53%		30-130%
321-60-8	2-Fluorobiphenyl	70%		30-130%
1718-51-0	Terphenyl-d14	83%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91145.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393
Run #2							

	Initial Weight	Final Volume
Run #1	21.0 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.0050	0.00086	mg/kg	
208-96-8	Acenaphthylene	ND	0.0050	0.00076	mg/kg	
120-12-7	Anthracene	ND	0.0050	0.0011	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.0050	0.0023	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.0050	0.0020	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.0050	0.0022	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.0050	0.0013	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.0050	0.0015	mg/kg	
218-01-9	Chrysene	ND	0.0050	0.0013	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0050	0.0014	mg/kg	
206-44-0	Fluoranthene	ND	0.0050	0.0015	mg/kg	
86-73-7	Fluorene	ND	0.0050	0.00098	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0050	0.0012	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.0099	0.0011	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.0099	0.00092	mg/kg	
85-01-8	Phenanthrene	ND	0.0050	0.0010	mg/kg	
129-00-0	Pyrene	ND	0.0050	0.0015	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	71%		30-130%
321-60-8	2-Fluorobiphenyl	70%		30-130%
1718-51-0	Terphenyl-d14	96%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK39985.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
Run #2							

	Initial Weight	Final Volume
Run #1	30.6 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0026	0.00075	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0026	0.00063	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	104%		61-167%
460-00-4	Bromofluorobenzene (S)	138%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE46-080414(18-22')DUP		
Lab Sample ID:	MC32591-2	Date Sampled:	08/04/14
Matrix:	SO - Soil	Date Received:	08/05/14
Method:	SW846 8015	Percent Solids:	96.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85247.D	1	08/07/14	AF	n/a	n/a	GAB4535
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.18 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	13	1.9	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	94%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080414-HCL		
Lab Sample ID:	MC32591-3	Date Sampled:	08/04/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	U21740.D	1	08/12/14	GK	n/a	n/a	MSU964
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080414-HCL		
Lab Sample ID:	MC32591-3	Date Sampled:	08/04/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	0.70	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080414-HCL		
Lab Sample ID:	MC32591-3	Date Sampled:	08/04/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/05/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	115%		70-130%
2037-26-5	Toluene-D8	113%		70-130%
460-00-4	4-Bromofluorobenzene	113%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080414-ST		
Lab Sample ID:	MC32591-4	Date Sampled:	08/04/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/05/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK39951.D	1	08/05/14	NK	08/05/14	OP39247	GBK1298
Run #2							

	Initial Volume	Final Volume
Run #1	36.5 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.014	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.014	0.0058	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	90%		36-173%
460-00-4	Bromofluorobenzene (S)	104%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody

LAB (LOCATION)

- ☐ [illegible]
- ☐ CALSCIENCE
- ☑ OTHER (Accutest Laboratories Technology Ctr W, Marlborough, MA 01752 (508-481-6200))
- ☐ Lab Vendor # (   )
- ☐ [illegible]

Lab Vendor #

Shell Oil Products Chain Of Custody Record

URS

Please Check Appropriate Box:

- ☑ ENV. SERVICES
- ☐ MOTIVA RETAIL
- ☐ SHELL RETAIL
- ☐ MOTIVA SD&CM
- ☐ CONSULTANT
- ☐ LUBES
- ☐ SHELL PIPELINE
- ☐ OTHER

Print Bill To Contact Name: Bob Billman

INCIDENT # (ENV SERVICES): 9 7 2 1 6 6 4 0

☐ CHECK IF NO INCIDENT # APPLIES

DATE: 8/4/2014

PAGE: 1 of 1

PO #:

SAP #: 3 4 0 0 0 1

SAMPLING COMPANY: URS CORPORATION

ADDRESS: 1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300; ST. LOUIS, MO 63110

PROJECT CONTACT (Hardcopy or PDF Report to): Elizabeth Kunkel, Bob Billman

TELEPHONE: 314-429-0100 | FAX: 314-429-0462 | E-MAIL: bob.billman@urs.com; elizabeth.kunkel@urs.com

SITE ADDRESS: Street and City: 900 South Central Ave; ROXANA | State: IL

Consultant Project No.: 4th St. Extension Well Install / 21562673.10200

LAB USE ONLY: MC32591

TURNAROUND TIME (CALENDAR DAYS): ☑ STANDARD (10 DAY) ☐ 5 DAYS ☐ 3 DAYS ☐ 2 DAYS ☐ 24 HOURS ☐ RESULTS NEEDED ON WEEKEND

☐ LA - RWQCB REPORT FORMAT ☐ UST AGENCY:

DELIVERABLES: ☐ LEVEL 1 ☑ LEVEL 2 ☐ LEVEL 3 ☑ LEVEL 4 ☑ OTHER (SPECIFY) EQQ

TEMPERATURE ON RECEIPT C°: Cooler #1 | Cooler #2 | Cooler #3

SPECIAL INSTRUCTIONS OR NOTES :

- Please include "J" values on Reports.
- Please provide sample receipt upon login.

- ☑ SHELL CONTRACT RATE APPLIES
- ☐ STATE REIMBURSEMENT RATE APPLIES
- ☐ EDD NOT NEEDED
- ☑ RECEIPT VERIFICATION REQUESTED
- ☐ PROVIDE LEVEL DATA

REQUESTED ANALYSIS

FIELD NOTES:

TEMPERATURE ON RECEIPT C°

LAB USE ONLY	Field Sample Identification	SAMPLING DATE	SAMPLING TIME	MATRIX	PRESERVATIVE HCL	HNO3	H2SO4	NONE	OTHER	NO. OF CONT.	VOC 8260B SL+TICS	VOC 8011 SL	SVOC 8270C SL+TICS	PAH 8270LL	Percent Moisture	TPH-GRO	PID (ppm)	Container PID Readings or Laboratory Notes
1	SVE48-080414 (18-22') ✓	8/4/2014	1330	S				2	5	7	X	X	X	X	X	X	5.4	
2	SVE48-080414 (18-22') Dup ✓	8/4/2014	1330	S				2	5	7	X	X	X	X	X	X	6.4	
3	TB-080414 HCL ✓			W	2						X							
4	TB 080414 ST ✓			W					2			X						
																		1E, 10J2, 1H2,

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
[signature]	FED EX 805766483070	8/4/14	1700
[signature]	[signature]	8-5-14	930

Custody Seals: 0.9°C

MC32591: Chain of Custody

Page 1 of 2

ACCUTEST LABORATORIES

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC32591 Client: URS Immediate Client Services Action Required: No

Date / Time Received: 8/5/2014 Delivery Method: Client Service Action Required at Login: No

Project: 900 SOUTH CENTRAL No. Coolers: 1 Airbill #'s:

Cooler Security	Y or N		Y or N
1. Custody Seals Present:	☑ ☐	3. COC Present:	☑ ☐
2. Custody Seals Intact:	☑ ☐	4. Smpl Dates/Time OK	☑ ☐

Cooler Temperature	Y or N
1. Temp criteria achieved:	☑ ☐
2. Cooler temp verification:	Infared gun
3. Cooler media:	Ice (bag)

Quality Control Preservation	Y or N	N/A
1. Trip Blank present / cooler:	☑ ☐	☐
2. Trip Blank listed on COC:	☑ ☐	☐
3. Samples preserved properly:	☑ ☐	
4. VOCs headspace free:	☑ ☐	☐

Sample Integrity - Documentation	Y or N
1. Sample labels present on bottles:	☑ ☐
2. Container labeling complete:	☑ ☐
3. Sample container label / COC agree:	☑ ☐

Sample Integrity - Condition	Y or N
1. Sample recvd within HT:	☑ ☐
2. All containers accounted for:	☑ ☐
3. Condition of sample:	Intact

Sample Integrity - Instructions	Y or N	N/A
1. Analysis requested is clear:	☑ ☐	
2. Bottles received for unspecified tests	☐ ☑	
3. Sufficient volume recvd for analysis:	☑ ☐	
4. Compositing instructions clear:	☐ ☐	☑
5. Filtering instructions clear:	☐ ☐	☑

Comments

MC32591: Chain of Custody
Page 2 of 2

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC32591

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC32591-1 Collected: 04-AUG-14 13:30 By: SVE46-080414(18-22')			Received: 05-AUG-14 By:			
MC32591-1	SM21 2540 B MOD.	07-AUG-14	HS			%SOL
MC32591-1	SW846 8011	07-AUG-14 16:33	NK	05-AUG-14	NE	V8011SL
MC32591-1	SW846 8015	07-AUG-14 19:38	AF			V8015GRO
MC32591-1	SW846 8270D	11-AUG-14 16:25	WK	06-AUG-14	PA	AB8270SL+
MC32591-1	SW846 8270D BY SIM	11-AUG-14 17:05	MR	06-AUG-14	PA	B8270SIMSL
MC32591-1	SW846 8270D	12-AUG-14 10:20	WK	06-AUG-14	PA	AB8270SL+
MC32591-1	SW846 8260C	14-AUG-14 17:45	KD			V8260SL+
MC32591-2 Collected: 04-AUG-14 13:30 By: SVE46-080414(18-22')DUP			Received: 05-AUG-14 By:			
MC32591-2	SM21 2540 B MOD.	07-AUG-14	HS			%SOL
MC32591-2	SW846 8011	07-AUG-14 16:52	NK	05-AUG-14	NE	V8011SL
MC32591-2	SW846 8015	07-AUG-14 20:16	AF			V8015GRO
MC32591-2	SW846 8270D	11-AUG-14 16:49	WK	06-AUG-14	PA	AB8270SL+
MC32591-2	SW846 8270D BY SIM	11-AUG-14 17:27	MR	06-AUG-14	PA	B8270SIMSL
MC32591-2	SW846 8260C	14-AUG-14 18:14	KD			V8260SL+
MC32591-3 Collected: 04-AUG-14 00:00 By: TB-080414-HCL			Received: 05-AUG-14 By:			
MC32591-3	SW846 8260C	12-AUG-14 13:47	GK			V8260SL+
MC32591-4 Collected: 04-AUG-14 00:00 By: TB-080414-ST			Received: 05-AUG-14 By:			
MC32591-4	SW846 8011	05-AUG-14 14:45	NK	05-AUG-14	FC	V8011SL

Accutest Internal Chain of Custody

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/05/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32591-1.1	Walk In Ref #5	Nicole Estey	08/05/14 14:22	Retrieve from Storage
MC32591-1.1	Nicole Estey	Walk In Ref #5	08/05/14 22:06	Return to Storage
MC32591-1.1	Walk In Ref #5	Alireza Zeighami	08/06/14 07:34	Retrieve from Storage
MC32591-1.1	Alireza Zeighami	Walk In Ref #5	08/06/14 08:33	Return to Storage
MC32591-1.1	Walk In Ref #5	Hamid Siamak	08/07/14 11:27	Retrieve from Storage
MC32591-1.1	Hamid Siamak	Walk In Ref #5	08/07/14 14:06	Return to Storage
MC32591-1.4	VOC Ref #10	Krysten Dufort	08/14/14 12:31	Retrieve from Storage
MC32591-1.4	Krysten Dufort	GCMSM	08/14/14 12:31	Load on Instrument
MC32591-1.4	GCMSM	Krysten Dufort	08/15/14 09:26	Unload from Instrument
MC32591-1.4	Krysten Dufort	VOC Ref #10	08/15/14 09:26	Return to Storage
MC32591-1.5	VOC Ref #10	Anthony Franciosa	08/07/14 07:53	Retrieve from Storage
MC32591-1.5	Anthony Franciosa	GCAB	08/07/14 07:53	Load on Instrument
MC32591-1.5	GCAB	Anthony Franciosa	08/08/14 09:08	Unload from Instrument
MC32591-1.5	Anthony Franciosa	VOC Ref #10	08/08/14 09:08	Return to Storage
MC32591-1.6	VOC Ref #10	Krysten Dufort	08/06/14 15:32	Retrieve from Storage
MC32591-1.6	Krysten Dufort	VOC Ref #10	08/07/14 11:12	Return to Storage
MC32591-2.1	Walk In Ref #5	Nicole Estey	08/05/14 14:22	Retrieve from Storage
MC32591-2.1	Nicole Estey	Walk In Ref #5	08/05/14 22:06	Return to Storage
MC32591-2.1	Walk In Ref #5	Alireza Zeighami	08/06/14 07:34	Retrieve from Storage
MC32591-2.1	Alireza Zeighami	Walk In Ref #5	08/06/14 08:33	Return to Storage
MC32591-2.1	Walk In Ref #5	Hamid Siamak	08/07/14 11:27	Retrieve from Storage
MC32591-2.1	Hamid Siamak	Walk In Ref #5	08/07/14 14:06	Return to Storage
MC32591-2.4	VOC Ref #10	Krysten Dufort	08/14/14 12:31	Retrieve from Storage
MC32591-2.4	Krysten Dufort	GCMSM	08/14/14 12:31	Load on Instrument
MC32591-2.4	GCMSM	Krysten Dufort	08/15/14 09:26	Unload from Instrument
MC32591-2.4	Krysten Dufort	VOC Ref #10	08/15/14 09:26	Return to Storage
MC32591-2.5	VOC Ref #10	Anthony Franciosa	08/07/14 07:53	Retrieve from Storage
MC32591-2.5	Anthony Franciosa	GCAB	08/07/14 07:53	Load on Instrument
MC32591-2.5	GCAB	Anthony Franciosa	08/08/14 09:08	Unload from Instrument
MC32591-2.5	Anthony Franciosa	VOC Ref #10	08/08/14 09:08	Return to Storage
MC32591-2.6	VOC Ref #10	Krysten Dufort	08/06/14 15:32	Retrieve from Storage
MC32591-2.6	Krysten Dufort	VOC Ref #10	08/07/14 11:12	Return to Storage
MC32591-3.1	VOC Ref #1	Gary Krasinski	08/12/14 11:36	Retrieve from Storage
MC32591-3.1	Gary Krasinski	GCMSU	08/12/14 11:36	Load on Instrument
MC32591-3.1	GCMSU	Gary Krasinski	08/13/14 08:47	Unload from Instrument
MC32591-3.1	Gary Krasinski	VOC Ref #1	08/13/14 08:47	Return to Storage

5.3

Accutest Internal Chain of Custody

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/05/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32591-4.2	VOC Ref #1	Marc Tahtamoni	08/05/14 14:07	Retrieve from Storage
MC32591-4.2	Marc Tahtamoni		08/06/14 14:22	Depleted

New England ACCUTEST LABORATORIES

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-MB	U21735.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	0.70	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-MB	U21735.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	0.50	0.50	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	0.50	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-MB	U21735.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	113%	70-130%
2037-26-5	Toluene-D8	113%	70-130%
460-00-4	4-Bromofluorobenzene	113%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-MB	M67619.D	1	08/14/14	KD	n/a	n/a	MSM2392

6.1.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	10.9	10	2.8	ug/kg	
107-02-8	Acrolein	ND	25	8.8	ug/kg	
107-13-1	Acrylonitrile	ND	25	2.7	ug/kg	
71-43-2	Benzene	ND	0.50	0.34	ug/kg	
108-86-1	Bromobenzene	ND	5.0	0.25	ug/kg	
74-97-5	Bromochloromethane	ND	5.0	0.35	ug/kg	
75-27-4	Bromodichloromethane	ND	2.0	0.21	ug/kg	
75-25-2	Bromoform	ND	2.0	0.35	ug/kg	
74-83-9	Bromomethane	ND	2.0	0.60	ug/kg	
78-93-3	2-Butanone (MEK)	ND	10	3.1	ug/kg	
104-51-8	n-Butylbenzene	ND	5.0	0.24	ug/kg	
135-98-8	sec-Butylbenzene	ND	5.0	0.75	ug/kg	
98-06-6	tert-Butylbenzene	ND	5.0	0.21	ug/kg	
75-15-0	Carbon disulfide	ND	5.0	0.13	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.0	0.22	ug/kg	
108-90-7	Chlorobenzene	ND	2.0	0.16	ug/kg	
75-00-3	Chloroethane	ND	5.0	0.76	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	1.3	ug/kg	
67-66-3	Chloroform	ND	2.0	0.17	ug/kg	
74-87-3	Chloromethane	ND	5.0	0.56	ug/kg	
95-49-8	o-Chlorotoluene	ND	5.0	0.19	ug/kg	
106-43-4	p-Chlorotoluene	ND	5.0	0.27	ug/kg	
124-48-1	Dibromochloromethane	ND	2.0	0.32	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	2.0	0.21	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	2.0	0.30	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	2.0	0.35	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.81	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.0	0.27	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.0	0.32	ug/kg	
75-35-4	1,1-Dichloroethene	ND	2.0	0.41	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	2.0	0.45	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	2.0	0.42	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.0	0.42	ug/kg	
142-28-9	1,3-Dichloropropane	ND	5.0	0.33	ug/kg	
594-20-7	2,2-Dichloropropane	ND	5.0	0.56	ug/kg	
563-58-6	1,1-Dichloropropene	ND	5.0	0.26	ug/kg	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-MB	M67619.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	2.0	0.23	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.0	0.26	ug/kg	
123-91-1	1,4-Dioxane	ND	25	20	ug/kg	
97-63-2	Ethyl methacrylate	ND	5.0	0.36	ug/kg	
100-41-4	Ethylbenzene	ND	2.0	0.69	ug/kg	
87-68-3	Hexachlorobutadiene	ND	5.0	0.57	ug/kg	
591-78-6	2-Hexanone	ND	10	0.76	ug/kg	
98-82-8	Isopropylbenzene	ND	5.0	0.17	ug/kg	
99-87-6	p-Isopropyltoluene	ND	5.0	0.17	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.0	0.18	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.54	ug/kg	
74-95-3	Methylene bromide	ND	5.0	0.46	ug/kg	
75-09-2	Methylene chloride	ND	2.0	0.53	ug/kg	
91-20-3	Naphthalene	ND	5.0	0.40	ug/kg	
103-65-1	n-Propylbenzene	ND	5.0	0.15	ug/kg	
100-42-5	Styrene	ND	5.0	0.17	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	0.40	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.0	0.39	ug/kg	
127-18-4	Tetrachloroethene	ND	2.0	0.31	ug/kg	
108-88-3	Toluene	ND	5.0	0.21	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.43	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.51	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.0	0.22	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.0	0.57	ug/kg	
79-01-6	Trichloroethene	ND	2.0	0.24	ug/kg	
75-69-4	Trichlorofluoromethane	ND	2.0	0.40	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.29	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	1.4	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	1.5	ug/kg	
108-05-4	Vinyl Acetate	ND	5.0	1.5	ug/kg	
75-01-4	Vinyl chloride	ND	2.0	0.91	ug/kg	
	m,p-Xylene	ND	2.0	0.44	ug/kg	
95-47-6	o-Xylene	ND	2.0	0.28	ug/kg	
1330-20-7	Xylene (total)	ND	2.0	0.22	ug/kg	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL.

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-MB	M67619.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	92%	70-130%
2037-26-5	Toluene-D8	92%	70-130%
460-00-4	4-Bromofluorobenzene	87%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-BS	U21732.D	1	08/12/14	GK	n/a	n/a	MSU964

6.2.1

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
67-64-1	Acetone	50	45.1	90	70-130
107-02-8	Acrolein	250	167	67* a	70-130
107-13-1	Acrylonitrile	50	50.3	101	70-130
71-43-2	Benzene	50	51.7	103	70-130
108-86-1	Bromobenzene	50	55.7	111	70-130
74-97-5	Bromochloromethane	50	50.4	101	70-130
75-27-4	Bromodichloromethane	50	53.1	106	70-130
75-25-2	Bromoform	50	46.7	93	70-130
74-83-9	Bromomethane	50	53.8	108	70-130
78-93-3	2-Butanone (MEK)	50	44.6	89	70-130
104-51-8	n-Butylbenzene	50	58.2	116	70-130
135-98-8	sec-Butylbenzene	50	61.1	122	70-130
98-06-6	tert-Butylbenzene	50	51.0	102	70-130
75-15-0	Carbon disulfide	50	54.3	109	70-130
56-23-5	Carbon tetrachloride	50	47.8	96	70-130
108-90-7	Chlorobenzene	50	52.3	105	70-130
75-00-3	Chloroethane	50	65.5	131* b	70-130
110-75-8	2-Chloroethyl vinyl ether	50	61.4	123	70-130
67-66-3	Chloroform	50	50.0	100	70-130
74-87-3	Chloromethane	50	51.4	103	70-130
95-49-8	o-Chlorotoluene	50	56.8	114	70-130
106-43-4	p-Chlorotoluene	50	55.3	111	70-130
124-48-1	Dibromochloromethane	50	50.8	102	70-130
95-50-1	1,2-Dichlorobenzene	50	55.2	110	70-130
541-73-1	1,3-Dichlorobenzene	50	55.4	111	70-130
106-46-7	1,4-Dichlorobenzene	50	54.4	109	70-130
75-71-8	Dichlorodifluoromethane	50	53.4	107	70-130
75-34-3	1,1-Dichloroethane	50	52.8	106	70-130
107-06-2	1,2-Dichloroethane	50	45.9	92	70-130
75-35-4	1,1-Dichloroethene	50	51.9	104	70-130
156-59-2	cis-1,2-Dichloroethene	50	49.7	99	70-130
156-60-5	trans-1,2-Dichloroethene	50	50.8	102	70-130
78-87-5	1,2-Dichloropropane	50	54.7	109	70-130
142-28-9	1,3-Dichloropropane	50	55.0	110	70-130
594-20-7	2,2-Dichloropropane	50	54.5	109	70-130
563-58-6	1,1-Dichloropropene	50	49.4	99	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-BS	U21732.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	50	58.2	116	70-130
10061-02-6	trans-1,3-Dichloropropene	50	63.8	128	70-130
123-91-1	1,4-Dioxane	125	186	149* b	70-130
97-63-2	Ethyl methacrylate	50	56.6	113	77-137
100-41-4	Ethylbenzene	50	51.8	104	70-130
87-68-3	Hexachlorobutadiene	50	55.1	110	70-130
591-78-6	2-Hexanone	50	43.6	87	70-130
98-82-8	Isopropylbenzene	50	61.4	123	70-130
99-87-6	p-Isopropyltoluene	50	58.5	117	70-130
1634-04-4	Methyl Tert Butyl Ether	50	49.9	100	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	50	49.7	99	70-130
74-95-3	Methylene bromide	50	49.3	99	70-130
75-09-2	Methylene chloride	50	51.8	104	70-130
91-20-3	Naphthalene	50	57.9	116	70-130
103-65-1	n-Propylbenzene	50	60.0	120	70-130
100-42-5	Styrene	50	51.3	103	70-130
630-20-6	1,1,1,2-Tetrachloroethane	50	46.9	94	70-130
79-34-5	1,1,2,2-Tetrachloroethane	50	58.2	116	70-130
127-18-4	Tetrachloroethene	50	51.7	103	70-130
108-88-3	Toluene	50	56.4	113	70-130
87-61-6	1,2,3-Trichlorobenzene	50	56.1	112	70-130
120-82-1	1,2,4-Trichlorobenzene	50	55.8	112	70-130
71-55-6	1,1,1-Trichloroethane	50	49.9	100	70-130
79-00-5	1,1,2-Trichloroethane	50	58.0	116	70-130
79-01-6	Trichloroethene	50	49.2	98	70-130
75-69-4	Trichlorofluoromethane	50	45.8	92	70-130
96-18-4	1,2,3-Trichloropropane	50	53.4	107	70-130
95-63-6	1,2,4-Trimethylbenzene	50	59.1	118	70-130
108-67-8	1,3,5-Trimethylbenzene	50	57.9	116	70-130
108-05-4	Vinyl Acetate	50	41.7	83	70-130
75-01-4	Vinyl chloride	50	53.2	106	70-130
	m,p-Xylene	100	103	103	70-130
95-47-6	o-Xylene	50	49.5	99	70-130
1330-20-7	Xylene (total)	150	152	101	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU964-BS	U21732.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	111%	70-130%
2037-26-5	Toluene-D8	120%	70-130%
460-00-4	4-Bromofluorobenzene	117%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.
(b) Outside control limits. Associated samples are non-detect for this compound.

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-BS	M67617.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
67-64-1	Acetone	50	58.3	117	70-130
107-02-8	Acrolein	250	198	79	70-130
107-13-1	Acrylonitrile	50	61.9	124	70-130
71-43-2	Benzene	50	51.5	103	70-130
108-86-1	Bromobenzene	50	52.8	106	70-130
74-97-5	Bromochloromethane	50	54.9	110	70-130
75-27-4	Bromodichloromethane	50	57.0	114	70-130
75-25-2	Bromoform	50	53.2	106	70-130
74-83-9	Bromomethane	50	45.7	91	70-130
78-93-3	2-Butanone (MEK)	50	57.6	115	70-130
104-51-8	n-Butylbenzene	50	50.3	101	70-130
135-98-8	sec-Butylbenzene	50	49.7	99	70-130
98-06-6	tert-Butylbenzene	50	50.3	101	70-130
75-15-0	Carbon disulfide	50	55.1	110	70-130
56-23-5	Carbon tetrachloride	50	49.0	98	70-130
108-90-7	Chlorobenzene	50	49.8	100	70-130
75-00-3	Chloroethane	50	54.2	108	70-130
110-75-8	2-Chloroethyl vinyl ether	50	47.3	95	10-160
67-66-3	Chloroform	50	52.5	105	70-130
74-87-3	Chloromethane	50	46.3	93	70-130
95-49-8	o-Chlorotoluene	50	51.4	103	70-130
106-43-4	p-Chlorotoluene	50	51.2	102	70-130
124-48-1	Dibromochloromethane	50	52.7	105	70-130
95-50-1	1,2-Dichlorobenzene	50	53.5	107	70-130
541-73-1	1,3-Dichlorobenzene	50	51.5	103	70-130
106-46-7	1,4-Dichlorobenzene	50	51.9	104	70-130
75-71-8	Dichlorodifluoromethane	50	46.8	94	70-130
75-34-3	1,1-Dichloroethane	50	54.5	109	70-130
107-06-2	1,2-Dichloroethane	50	54.8	110	70-130
75-35-4	1,1-Dichloroethene	50	51.3	103	70-130
156-59-2	cis-1,2-Dichloroethene	50	52.5	105	70-130
156-60-5	trans-1,2-Dichloroethene	50	50.7	101	70-130
78-87-5	1,2-Dichloropropane	50	53.2	106	70-130
142-28-9	1,3-Dichloropropane	50	52.7	105	70-130
594-20-7	2,2-Dichloropropane	50	51.5	103	70-130
563-58-6	1,1-Dichloropropene	50	47.5	95	70-130

* = Outside of Control Limits.

6.2.2

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-BS	M67617.D	1	08/14/14	KD	n/a	n/a	MSM2392

6.2.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	50	53.3	107	70-130
10061-02-6	trans-1,3-Dichloropropene	50	58.6	117	70-130
123-91-1	1,4-Dioxane	125	176	141* a	70-130
97-63-2	Ethyl methacrylate	50	57.3	115	76-141
100-41-4	Ethylbenzene	50	49.0	98	70-130
87-68-3	Hexachlorobutadiene	50	45.7	91	70-130
591-78-6	2-Hexanone	50	49.7	99	70-130
98-82-8	Isopropylbenzene	50	52.4	105	70-130
99-87-6	p-Isopropyltoluene	50	49.7	99	70-130
1634-04-4	Methyl Tert Butyl Ether	50	55.9	112	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	50	56.1	112	70-130
74-95-3	Methylene bromide	50	55.9	112	70-130
75-09-2	Methylene chloride	50	53.6	107	70-130
91-20-3	Naphthalene	50	57.3	115	70-130
103-65-1	n-Propylbenzene	50	51.3	103	70-130
100-42-5	Styrene	50	52.5	105	70-130
630-20-6	1,1,1,2-Tetrachloroethane	50	49.4	99	70-130
79-34-5	1,1,2,2-Tetrachloroethane	50	55.7	111	70-130
127-18-4	Tetrachloroethene	50	45.5	91	70-130
108-88-3	Toluene	50	51.2	102	70-130
87-61-6	1,2,3-Trichlorobenzene	50	53.9	108	70-130
120-82-1	1,2,4-Trichlorobenzene	50	52.9	106	70-130
71-55-6	1,1,1-Trichloroethane	50	50.1	100	70-130
79-00-5	1,1,2-Trichloroethane	50	54.9	110	70-130
79-01-6	Trichloroethene	50	49.2	98	70-130
75-69-4	Trichlorofluoromethane	50	43.9	88	70-130
96-18-4	1,2,3-Trichloropropane	50	56.7	113	70-130
95-63-6	1,2,4-Trimethylbenzene	50	52.7	105	70-130
108-67-8	1,3,5-Trimethylbenzene	50	49.1	98	70-130
108-05-4	Vinyl Acetate	50	47.3	95	70-130
75-01-4	Vinyl chloride	50	46.4	93	70-130
	m,p-Xylene	100	98.4	98	70-130
95-47-6	o-Xylene	50	50.7	101	70-130
1330-20-7	Xylene (total)	150	149	99	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2392-BS	M67617.D	1	08/14/14	KD	n/a	n/a	MSM2392

6.2.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	90%	70-130%
2037-26-5	Toluene-D8	89%	70-130%
460-00-4	4-Bromofluorobenzene	88%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32593-2AMS	U21746.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2AMSD	U21747.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2A	U21742.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	MC32593-2A ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	10 U		50	23.9	48* [a]	50	26.5	53* [a]	10	70-130/30
107-02-8	Acrolein	50 U		250	147	59* [a]	250	144	58* [a]	2	70-130/30
107-13-1	Acrylonitrile	10 U		50	52.9	106	50	53.5	107	1	70-130/30
71-43-2	Benzene	1.0 U		50	53.6	107	50	50.9	102	5	70-130/30
108-86-1	Bromobenzene	5.0 U		50	50.7	101	50	52.2	104	3	70-130/30
74-97-5	Bromochloromethane	5.0 U		50	51.7	103	50	49.3	99	5	70-130/30
75-27-4	Bromodichloromethane	2.0 U		50	52.3	105	50	51.5	103	2	70-130/30
75-25-2	Bromoform	2.0 U		50	43.3	87	50	42.3	85	2	70-130/30
74-83-9	Bromomethane	5.0 U		50	51.6	103	50	52.6	105	2	70-130/30
78-93-3	2-Butanone (MEK)	10 U		50	35.9	72	50	36.3	73	1	70-130/30
104-51-8	n-Butylbenzene	5.0 U		50	51.7	103	50	51.1	102	1	70-130/30
135-98-8	sec-Butylbenzene	5.0 U		50	52.8	106	50	52.9	106	0	70-130/30
98-06-6	tert-Butylbenzene	5.0 U		50	46.2	92	50	46.2	92	0	70-130/30
75-15-0	Carbon disulfide	5.0 U		50	43.6	87	50	42.1	84	4	70-130/30
56-23-5	Carbon tetrachloride	2.0 U		50	44.2	88	50	43.5	87	2	70-130/30
108-90-7	Chlorobenzene	2.0 U		50	49.9	100	50	49.6	99	1	70-130/30
75-00-3	Chloroethane	5.0 U		50	66.3	133* [a]	50	65.2	130	2	70-130/30
110-75-8	2-Chloroethyl vinyl ether	10 U		50	4.4	9* [a]	50	4.5	9* [a]	2	70-130/30
67-66-3	Chloroform	2.0 U		50	52.9	106	50	49.9	100	6	70-130/30
74-87-3	Chloromethane	5.0 U		50	54.1	108	50	54.3	109	0	70-130/30
95-49-8	o-Chlorotoluene	5.0 U		50	52.9	106	50	53.4	107	1	70-130/30
106-43-4	p-Chlorotoluene	5.0 U		50	50.8	102	50	52.0	104	2	70-130/30
124-48-1	Dibromochloromethane	2.0 U		50	46.1	92	50	45.5	91	1	70-130/30
95-50-1	1,2-Dichlorobenzene	2.0 U		50	53.1	106	50	53.0	106	0	70-130/30
541-73-1	1,3-Dichlorobenzene	2.0 U		50	52.0	104	50	51.9	104	0	70-130/30
106-46-7	1,4-Dichlorobenzene	2.0 U		50	52.2	104	50	51.3	103	2	70-130/30
75-71-8	Dichlorodifluoromethane	5.0 U		50	50.4	101	50	48.9	98	3	70-130/30
75-34-3	1,1-Dichloroethane	3.9		50	59.1	110	50	56.0	104	5	70-130/30
107-06-2	1,2-Dichloroethane	2.0 U		50	47.6	95	50	44.9	90	6	70-130/30
75-35-4	1,1-Dichloroethene	2.0 U		50	51.7	103	50	50.0	100	3	70-130/30
156-59-2	cis-1,2-Dichloroethene	2.0 U		50	51.7	103	50	49.8	100	4	70-130/30
156-60-5	trans-1,2-Dichloroethene	2.0 U		50	51.1	102	50	49.7	99	3	70-130/30
78-87-5	1,2-Dichloropropane	2.0 U		50	54.0	108	50	53.9	108	0	70-130/30
142-28-9	1,3-Dichloropropane	5.0 U		50	51.7	103	50	53.3	107	3	70-130/30
594-20-7	2,2-Dichloropropane	5.0 U		50	52.5	105	50	51.0	102	3	70-130/30
563-58-6	1,1-Dichloropropene	5.0 U		50	49.1	98	50	45.7	91	7	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32593-2AMS	U21746.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2AMSD	U21747.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2A	U21742.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Compound	MC32593-2A ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	1.0 U		50	51.1	102	50	55.4	111	8	70-130/30
10061-02-6	trans-1,3-Dichloropropene	1.0 U		50	50.6	101	50	60.1	120	17	70-130/30
123-91-1	1,4-Dioxane	50 U		125	111	89	125	135	108	20	70-130/30
97-63-2	Ethyl methacrylate	5.0 U		50	47.4	95	50	54.6	109	14	72-139/30
100-41-4	Ethylbenzene	2.0 U		50	49.7	99	50	48.7	97	2	70-130/30
87-68-3	Hexachlorobutadiene	10 U		50	43.6	87	50	43.2	86	1	70-130/30
591-78-6	2-Hexanone	10 U		50	32.2	64* a	50	34.6	69* a	7	70-130/30
98-82-8	Isopropylbenzene	5.0 U		50	55.8	112	50	55.6	111	0	70-130/30
99-87-6	p-Isopropyltoluene	5.0 U		50	49.5	99	50	49.8	100	1	70-130/30
1634-04-4	Methyl Tert Butyl Ether	2.0 U		50	51.3	103	50	51.5	103	0	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	10 U		50	50.7	101	50	53.7	107	6	70-130/30
74-95-3	Methylene bromide	5.0 U		50	50.6	101	50	48.3	97	5	70-130/30
75-09-2	Methylene chloride	2.0 U		50	53.7	107	50	52.2	104	3	70-130/30
91-20-3	Naphthalene	5.0 U		50	52.7	105	50	53.6	107	2	70-130/30
103-65-1	n-Propylbenzene	5.0 U		50	54.9	110	50	55.7	111	1	70-130/30
100-42-5	Styrene	5.0 U		50	43.1	86	50	43.1	86	0	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	5.0 U		50	48.0	96	50	43.9	88	9	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	2.0 U		50	59.3	119	50	59.7	119	1	70-130/30
127-18-4	Tetrachloroethene	2.0 U		50	47.9	96	50	45.7	91	5	70-130/30
108-88-3	Toluene	2.0 U		50	51.3	103	50	54.0	108	5	70-130/30
87-61-6	1,2,3-Trichlorobenzene	5.0 U		50	48.4	97	50	49.2	98	2	70-130/30
120-82-1	1,2,4-Trichlorobenzene	5.0 U		50	48.4	97	50	49.4	99	2	70-130/30
71-55-6	1,1,1-Trichloroethane	4.8		50	52.2	95	50	51.2	93	2	70-130/30
79-00-5	1,1,2-Trichloroethane	2.0 U		50	51.5	103	50	58.1	116	12	70-130/30
79-01-6	Trichloroethene	2.0 U		50	50.6	101	50	46.6	93	8	70-130/30
75-69-4	Trichlorofluoromethane	2.0 U		50	44.2	88	50	43.6	87	1	70-130/30
96-18-4	1,2,3-Trichloropropane	5.0 U		50	54.3	109	50	55.5	111	2	70-130/30
95-63-6	1,2,4-Trimethylbenzene	5.0 U		50	51.0	102	50	51.2	102	0	70-130/30
108-67-8	1,3,5-Trimethylbenzene	5.0 U		50	48.1	96	50	48.4	97	1	70-130/30
108-05-4	Vinyl Acetate	5.0 U		50	45.2	90	50	41.9	84	8	70-130/30
75-01-4	Vinyl chloride	2.0 U		50	52.9	106	50	51.8	104	2	70-130/30
	m,p-Xylene	2.0 U		100	96.8	97	100	94.3	94	3	70-130/30
95-47-6	o-Xylene	2.0 U		50	48.8	98	50	45.8	92	6	70-130/30
1330-20-7	Xylene (total)	2.0 U		150	146	97	150	140	93	4	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32593-2AMS	U21746.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2AMSD	U21747.D	1	08/12/14	GK	n/a	n/a	MSU964
MC32593-2A	U21742.D	1	08/12/14	GK	n/a	n/a	MSU964

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-3

CAS No.	Surrogate Recoveries	MS	MSD	MC32593-2A	Limits
1868-53-7	Dibromofluoromethane	119%	112%	126%	70-130%
2037-26-5	Toluene-D8	112%	120%	107%	70-130%
460-00-4	4-Bromofluorobenzene	114%	120%	110%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32787-1MS	M67630.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1MSD	M67631.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1	M67621.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	MC32787-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		59.6	38.0	64* [a]	53.4	32.3	60* [a]	16	70-130/30
107-02-8	Acrolein	ND		298	104	35* [a]	267	116	43* [a]	11	70-130/30
107-13-1	Acrylonitrile	ND		59.6	72.4	122	53.4	52.0	97	33* [b]	70-130/30
71-43-2	Benzene	ND		59.6	60.3	101	53.4	40.4	76	40* [b]	70-130/30
108-86-1	Bromobenzene	ND		59.6	62.0	104	53.4	43.0	80	36* [b]	70-130/30
74-97-5	Bromochloromethane	ND		59.6	68.2	114	53.4	45.7	86	40* [b]	70-130/30
75-27-4	Bromodichloromethane	ND		59.6	70.7	119	53.4	48.2	90	38* [b]	70-130/30
75-25-2	Bromoform	ND		59.6	69.9	117	53.4	51.6	97	30	70-130/30
74-83-9	Bromomethane	ND		59.6	52.4	88	53.4	50.7	95	3	70-130/30
78-93-3	2-Butanone (MEK)	ND		59.6	52.8	89	53.4	39.9	75	28	70-130/30
104-51-8	n-Butylbenzene	ND		59.6	55.1	92	53.4	38.2	71	36* [b]	70-130/30
135-98-8	sec-Butylbenzene	ND		59.6	57.5	97	53.4	39.5	74	37* [b]	70-130/30
98-06-6	tert-Butylbenzene	ND		59.6	59.5	100	53.4	40.2	75	39* [b]	70-130/30
75-15-0	Carbon disulfide	ND		59.6	65.2	109	53.4	42.8	80	41* [b]	70-130/30
56-23-5	Carbon tetrachloride	ND		59.6	59.7	100	53.4	39.1	73	42* [b]	70-130/30
108-90-7	Chlorobenzene	ND		59.6	58.6	98	53.4	40.5	76	37* [b]	70-130/30
75-00-3	Chloroethane	ND		59.6	61.6	103	53.4	59.8	112	3	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		59.6	ND	0* [a]	53.4	ND	0* [a]	nc	10-160/30
67-66-3	Chloroform	ND		59.6	65.0	109	53.4	42.8	80	41* [b]	70-130/30
74-87-3	Chloromethane	ND		59.6	53.2	89	53.4	50.2	94	6	70-130/30
95-49-8	o-Chlorotoluene	ND		59.6	58.8	99	53.4	40.7	76	36* [b]	70-130/30
106-43-4	p-Chlorotoluene	ND		59.6	57.9	97	53.4	39.9	75	37* [b]	70-130/30
124-48-1	Dibromochloromethane	ND		59.6	65.7	110	53.4	47.5	89	32* [b]	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		59.6	63.0	106	53.4	43.6	82	36* [b]	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		59.6	58.7	99	53.4	40.7	76	36* [b]	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		59.6	58.5	98	53.4	40.3	75	37* [b]	70-130/30
75-71-8	Dichlorodifluoromethane	ND		59.6	53.6	90	53.4	51.7	97	4	70-130/30
75-34-3	1,1-Dichloroethane	ND		59.6	66.4	111	53.4	43.6	82	41* [b]	70-130/30
107-06-2	1,2-Dichloroethane	ND		59.6	67.7	114	53.4	45.9	86	38* [b]	70-130/30
75-35-4	1,1-Dichloroethene	ND		59.6	63.0	106	53.4	40.9	77	43* [b]	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		59.6	63.6	107	53.4	42.0	79	41* [b]	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		59.6	60.9	102	53.4	40.5	76	40* [b]	70-130/30
78-87-5	1,2-Dichloropropane	ND		59.6	64.7	109	53.4	43.3	81	40* [b]	70-130/30
142-28-9	1,3-Dichloropropane	ND		59.6	63.8	107	53.4	45.6	85	33* [b]	70-130/30
594-20-7	2,2-Dichloropropane	ND		59.6	63.2	106	53.4	41.4	77	42* [b]	70-130/30
563-58-6	1,1-Dichloropropene	ND		59.6	56.3	94	53.4	37.0	69* [a]	41* [b]	70-130/30

* = Outside of Control Limits.

6.3.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32787-1MS	M67630.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1MSD	M67631.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1	M67621.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Compound	MC32787-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		59.6	64.6	108	53.4	44.5	83	37* b	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		59.6	73.2	123	53.4	51.5	96	35* b	70-130/30
123-91-1	1,4-Dioxane	ND		149	192	129	134	157	118	20	70-130/30
97-63-2	Ethyl methacrylate	ND		59.6	80.3	135	53.4	58.2	109	32* b	41-160/30
100-41-4	Ethylbenzene	ND		59.6	56.3	94	53.4	37.9	71	39* b	70-130/30
87-68-3	Hexachlorobutadiene	ND		59.6	48.6	82	53.4	33.4	62* a	37* b	70-130/30
591-78-6	2-Hexanone	ND		59.6	54.1	91	53.4	43.8	82	21	70-130/30
98-82-8	Isopropylbenzene	ND		59.6	60.4	101	53.4	40.6	76	39* b	70-130/30
99-87-6	p-Isopropyltoluene	ND		59.6	56.5	95	53.4	39.1	73	36* b	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		59.6	74.3	125	53.4	50.7	95	38* b	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		59.6	80.6	135* a	53.4	63.7	119	23	70-130/30
74-95-3	Methylene bromide	ND		59.6	66.3	111	53.4	47.5	89	33* b	70-130/30
75-09-2	Methylene chloride	ND		59.6	65.3	110	53.4	42.8	80	42* b	70-130/30
91-20-3	Naphthalene	ND		59.6	68.5	115	53.4	49.1	92	33* b	70-130/30
103-65-1	n-Propylbenzene	ND		59.6	57.8	97	53.4	39.5	74	38* b	70-130/30
100-42-5	Styrene	ND		59.6	54.4	91	53.4	34.4	64* a	45* b	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		59.6	61.8	104	53.4	43.7	82	34* b	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		59.6	74.9	126	53.4	55.2	103	30	70-130/30
127-18-4	Tetrachloroethene	ND		59.6	51.4	86	53.4	34.1	64* a	40* b	70-130/30
108-88-3	Toluene	0.56		59.6	60.4	100	53.4	41.1	76	38* b	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		59.6	54.5	91	53.4	38.5	72	34* b	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		59.6	50.9	85	53.4	34.7	65* a	38* b	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		59.6	63.4	106	53.4	41.2	77	42* b	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		59.6	73.5	123	53.4	52.7	99	33* b	70-130/30
79-01-6	Trichloroethene	ND		59.6	58.0	97	53.4	38.6	72	40* b	70-130/30
75-69-4	Trichlorofluoromethane	ND		59.6	50.8	85	53.4	49.1	92	3	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		59.6	74.4	125	53.4	56.1	105	28	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		59.6	59.9	101	53.4	40.9	77	38* b	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		59.6	56.3	94	53.4	38.2	71	38* b	70-130/30
108-05-4	Vinyl Acetate	ND		59.6	23.7	40* a	53.4	15.2	28* a	44* b	70-130/30
75-01-4	Vinyl chloride	ND		59.6	53.4	90	53.4	51.2	96	4	70-130/30
	m,p-Xylene	ND		119	112	94	107	76.0	71	38* b	70-130/30
95-47-6	o-Xylene	0.50		59.6	58.9	98	53.4	40.2	74	38* b	70-130/30
1330-20-7	Xylene (total)	1.1		179	171	95	160	116	72	38* b	70-130/30

* = Outside of Control Limits.

6.3.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32787-1MS	M67630.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1MSD	M67631.D	1	08/14/14	KD	n/a	n/a	MSM2392
MC32787-1	M67621.D	1	08/14/14	KD	n/a	n/a	MSM2392

The QC reported here applies to the following samples: Method: SW846 8260C

MC32591-1, MC32591-2

CAS No.	Surrogate Recoveries	MS	MSD	MC32787-1	Limits
1868-53-7	Dibromofluoromethane	99%	99%	98%	70-130%
2037-26-5	Toluene-D8	89%	90%	91%	70-130%
460-00-4	4-Bromofluorobenzene	86%	87%	87%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(b) High RPD due to possible matrix interference and/or sample non-homogeneity.

6.3.2

* = Outside of Control Limits.

Volatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSM2392-CC2378	Injection Date:	08/14/14
Lab File ID:	M67617.D	Injection Time:	15:19
Instrument ID:	GCMSM	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	267397	9.35	433603	10.23	184188	13.50	232245	16.07	91879	6.85
Upper Limit [a]	534794	9.85	867206	10.73	368376	14.00	464490	16.57	183758	7.35
Lower Limit [b]	133699	8.85	216802	9.73	92094	13.00	116123	15.57	45940	6.35
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSM2392-BS	267397	9.35	433603	10.23	184188	13.50	232245	16.07	91879	6.85
MSM2392-MB	263662	9.35	417189	10.23	176313	13.50	232190	16.07	89648	6.86
ZZZZZZ	139794	9.35	241713	10.23	73415[c]	13.51	50493[c]	16.07	136767	6.84
MC32787-1	276469	9.35	447075	10.23	201127	13.50	265683	16.07	155307	6.85
MC32591-1	264237	9.35	430418	10.23	188395	13.50	261165	16.07	152963	6.85
MC32591-2	251786	9.35	408223	10.22	180198	13.51	250530	16.07	153511	6.84
ZZZZZZ	234844	9.34	386074	10.22	149439	13.50	161274	16.07	130434	6.84
ZZZZZZ	272742	9.35	446483	10.23	197037	13.50	269985	16.07	164978	6.86
ZZZZZZ	265452	9.35	433275	10.23	189836	13.51	261180	16.07	145348	6.84
ZZZZZZ	256954	9.34	423231	10.22	184773	13.51	248138	16.07	146718	6.84
ZZZZZZ	264432	9.35	440668	10.22	188673	13.50	259371	16.07	151440	6.84
ZZZZZZ	266733	9.35	433404	10.23	192003	13.50	257670	16.07	156009	6.84
MC32787-1MS	278199	9.35	470182	10.23	215960	13.51	279319	16.07	148542	6.86
MC32787-1MSD	288866	9.35	481435	10.23	219893	13.51	285120	16.07	158707	6.84
ZZZZZZ	272752	9.35	434817	10.23	191636	13.50	255135	16.07	86591	6.85
ZZZZZZ	271114	9.35	438284	10.23	192380	13.51	250819	16.07	89046	6.84
ZZZZZZ	276221	9.35	442476	10.23	194884	13.51	250655	16.07	87564	6.86
ZZZZZZ	242790	9.34	389471	10.23	171121	13.50	224019	16.07	86792	6.85
ZZZZZZ	252011	9.35	400701	10.23	180859	13.50	231081	16.07	85063	6.85
ZZZZZZ	251653	9.35	400664	10.22	174354	13.50	232696	16.07	90787	6.86
ZZZZZZ	243822	9.35	391827	10.23	168014	13.51	228097	16.07	84291	6.84

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.
(c) Outside control limits due to possible matrix interference. Confirmed by reanalysis.

6.4.1

Volatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSU964-CC957	Injection Date:	08/12/14
Lab File ID:	U21732.D	Injection Time:	10:09
Instrument ID:	GCMSU	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	971696	8.97	1580255	9.84	626725	13.10	844070	15.66	372781	6.60
Upper Limit [a]	1943392	9.47	3160510	10.34	1253450	13.60	1688140	16.16	745562	7.10
Lower Limit [b]	485848	8.47	790128	9.34	313363	12.60	422035	15.16	186391	6.10

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSU964-BS	971696	8.97	1580255	9.84	626725	13.10	844070	15.66	372781	6.60
MSU964-MB	880148	8.98	1373168	9.84	498721	13.10	793141	15.67	368133	6.61
ZZZZZZ	891179	8.98	1406478	9.85	477609	13.10	785838	15.67	326751	6.63
ZZZZZZ	856398	8.98	1357622	9.85	477254	13.10	737578	15.67	315519	6.61
ZZZZZZ	818836	8.98	1267918	9.85	423888	13.10	762580	15.67	339815	6.62
ZZZZZZ	818252	8.98	1275326	9.85	442772	13.10	762825	15.67	329437	6.61
MC32591-3	814558	8.98	1295143	9.85	456710	13.10	717939	15.67	295241	6.61
ZZZZZZ	789786	8.98	1276626	9.84	459564	13.10	707125	15.67	331160	6.61
MC32593-2A	732946	8.98	1146239	9.85	398880	13.10	706740	15.67	320556	6.61
MC32593-3A	790096	8.98	1264228	9.84	464847	13.10	696659	15.67	317363	6.61
ZZZZZZ	781023	8.98	1256863	9.85	419984	13.10	699690	15.67	304734	6.62
ZZZZZZ	762242	8.98	1215349	9.85	428364	13.10	684986	15.67	338274	6.63
MC32593-2AMS	796149	8.97	1340705	9.84	488934	13.10	700302	15.66	328936	6.62
MC32593-2AMSD	807172	8.97	1344800	9.84	541224	13.10	728118	15.66	348109	6.63
MC32593-3AMS	802949	8.97	1356387	9.84	489797	13.10	710808	15.66	346186	6.62
MC32593-3AMSD	821327	8.97	1385754	9.84	510132	13.09	725910	15.66	338164	6.62
ZZZZZZ	767882	8.98	1235142	9.84	425478	13.10	709044	15.66	347369	6.63
ZZZZZZ	786314	8.98	1249693	9.84	422130	13.10	711293	15.67	339285	6.62
ZZZZZZ	721001	8.98	1157270	9.85	403758	13.10	682954	15.67	345611	6.63
ZZZZZZ	770447	8.98	1276432	9.84	423141	13.10	681996	15.67	293157	6.62
ZZZZZZ	752004	8.98	1219553	9.85	412350	13.10	690110	15.67	338502	6.62
ZZZZZZ	777148	8.97	1299958	9.84	467791	13.10	663033	15.67	331601	6.61
ZZZZZZ	688142	8.98	1077805	9.85	370409	13.10	635136	15.67	326090	6.62
MSU964-ECC957	696632	8.97	1187257	9.84	445683	13.10	667704	15.66	311175	6.64

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.4.2

Volatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32591-3	U21740.D	115	113	113
MC32593-2AMS	U21746.D	119	112	114
MC32593-2AMSD	U21747.D	112	120	120
MSU964-BS	U21732.D	111	120	117
MSU964-MB	U21735.D	113	113	113

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

Volatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32591-1	M67622.D	98	90	85
MC32591-2	M67623.D	100	92	85
MC32787-1MS	M67630.D	99	89	86
MC32787-1MSD	M67631.D	99	90	87
MSM2392-BS	M67617.D	90	89	88
MSM2392-MB	M67619.D	92	92	87

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.2

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-MB	F75240.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	490	61	ug/kg	
95-57-8	2-Chlorophenol	ND	250	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	490	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	490	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	490	80	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	980	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	490	61	ug/kg	
95-48-7	2-Methylphenol	ND	490	19	ug/kg	
	3&4-Methylphenol	ND	490	24	ug/kg	
88-75-5	2-Nitrophenol	ND	490	13	ug/kg	
100-02-7	4-Nitrophenol	ND	980	92	ug/kg	
87-86-5	Pentachlorophenol	ND	490	35	ug/kg	
108-95-2	Phenol	ND	250	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	490	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	490	12	ug/kg	
62-53-3	Aniline	ND	490	25	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	250	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	250	10	ug/kg	
100-51-6	Benzyl Alcohol	ND	490	25	ug/kg	
91-58-7	2-Chloronaphthalene	ND	250	13	ug/kg	
106-47-8	4-Chloroaniline	ND	490	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	250	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	250	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	250	18	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	250	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	250	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	490	33	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	490	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	250	25	ug/kg	
132-64-9	Dibenzofuran	ND	98	14	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	250	26	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	250	7.7	ug/kg	
84-66-2	Diethyl phthalate	ND	250	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	250	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	250	9.1	ug/kg	
118-74-1	Hexachlorobenzene	ND	250	15	ug/kg	

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-MB	F75240.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	490	120	ug/kg	
67-72-1	Hexachloroethane	ND	250	12	ug/kg	
78-59-1	Isophorone	ND	250	11	ug/kg	
88-74-4	2-Nitroaniline	ND	490	12	ug/kg	
99-09-2	3-Nitroaniline	ND	490	27	ug/kg	
100-01-6	4-Nitroaniline	ND	490	12	ug/kg	
98-95-3	Nitrobenzene	ND	250	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	250	12	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	250	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	250	15	ug/kg	
110-86-1	Pyridine	ND	490	25	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	81%	30-130%
4165-62-2	Phenol-d5	76%	30-130%
118-79-6	2,4,6-Tribromophenol	76%	30-130%
4165-60-0	Nitrobenzene-d5	64%	30-130%
321-60-8	2-Fluorobiphenyl	76%	30-130%
1718-51-0	Terphenyl-d14	84%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39279-MB	I91140.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32591-1, MC32591-2

7.1.2

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.9	0.85	ug/kg	
208-96-8	Acenaphthylene	ND	4.9	0.75	ug/kg	
120-12-7	Anthracene	ND	4.9	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.9	2.3	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.9	2.0	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.9	2.2	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.9	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.9	1.5	ug/kg	
218-01-9	Chrysene	ND	4.9	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.9	1.4	ug/kg	
206-44-0	Fluoranthene	2.5	4.9	1.4	ug/kg	J
86-73-7	Fluorene	ND	4.9	0.97	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.9	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	ND	9.8	1.1	ug/kg	
91-57-6	2-Methylnaphthalene	ND	9.8	0.91	ug/kg	
85-01-8	Phenanthrene	1.8	4.9	1.0	ug/kg	J
129-00-0	Pyrene	2.3	4.9	1.5	ug/kg	J

CAS No.	Surrogate Recoveries		Limits
4165-60-0	Nitrobenzene-d5	81%	30-130%
321-60-8	2-Fluorobiphenyl	76%	30-130%
1718-51-0	Terphenyl-d14	95%	30-130%

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-BS	F75241.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
65-85-0	Benzoic acid	2390	1940	81	30-130
95-57-8	2-Chlorophenol	2390	1990	83	30-130
59-50-7	4-Chloro-3-methyl phenol	2390	1710	71	30-130
120-83-2	2,4-Dichlorophenol	2390	1770	74	30-130
105-67-9	2,4-Dimethylphenol	2390	1650	69	30-130
51-28-5	2,4-Dinitrophenol	2390	1600	67	30-130
534-52-1	4,6-Dinitro-o-cresol	2390	1980	83	30-130
95-48-7	2-Methylphenol	2390	1920	80	30-130
	3&4-Methylphenol	4790	3780	79	30-130
88-75-5	2-Nitrophenol	2390	1910	80	30-130
100-02-7	4-Nitrophenol	2390	1450	61	30-130
87-86-5	Pentachlorophenol	2390	2140	89	30-130
108-95-2	Phenol	2390	1770	74	30-130
95-95-4	2,4,5-Trichlorophenol	2390	2020	84	30-130
88-06-2	2,4,6-Trichlorophenol	2390	1950	81	30-130
62-53-3	Aniline	2390	1600	67	40-140
101-55-3	4-Bromophenyl phenyl ether	2390	1880	79	40-140
85-68-7	Butyl benzyl phthalate	2390	2390	100	40-140
100-51-6	Benzyl Alcohol	2390	1910	80	40-140
91-58-7	2-Chloronaphthalene	2390	2040	85	40-140
106-47-8	4-Chloroaniline	2390	1620	68	40-140
111-91-1	bis(2-Chloroethoxy)methane	2390	1580	66	40-140
111-44-4	bis(2-Chloroethyl)ether	2390	2050	86	40-140
108-60-1	bis(2-Chloroisopropyl)ether	2390	2810	117	40-140
7005-72-3	4-Chlorophenyl phenyl ether	2390	1660	69	40-140
122-66-7	1,2-Diphenylhydrazine	2390	1870	78	40-140
121-14-2	2,4-Dinitrotoluene	2390	1910	80	40-140
606-20-2	2,6-Dinitrotoluene	2390	1770	74	40-140
91-94-1	3,3'-Dichlorobenzidine	2390	1700	71	40-140
132-64-9	Dibenzofuran	2390	1820	76	40-140
84-74-2	Di-n-butyl phthalate	2390	2030	85	40-140
117-84-0	Di-n-octyl phthalate	2390	2510	105	40-140
84-66-2	Diethyl phthalate	2390	1920	80	40-140
131-11-3	Dimethyl phthalate	2390	1950	81	40-140
117-81-7	bis(2-Ethylhexyl)phthalate	2390	2390	100	40-140
118-74-1	Hexachlorobenzene	2390	1850	77	40-140

* = Outside of Control Limits.

7.2.1

7

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-BS	F75241.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
77-47-4	Hexachlorocyclopentadiene	2390	917	38* [a]	40-140
67-72-1	Hexachloroethane	2390	1770	74	40-140
78-59-1	Isophorone	2390	1510	63	40-140
88-74-4	2-Nitroaniline	2390	2120	89	40-140
99-09-2	3-Nitroaniline	2390	1790	75	40-140
100-01-6	4-Nitroaniline	2390	1900	79	40-140
98-95-3	Nitrobenzene	2390	1440	60	40-140
62-75-9	n-Nitrosodimethylamine	2390	1730	72	40-140
621-64-7	N-Nitroso-di-n-propylamine	2390	1740	73	40-140
86-30-6	N-Nitrosodiphenylamine	2390	1820	76	40-140
110-86-1	Pyridine	2390	1510	63	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	80%	30-130%
4165-62-2	Phenol-d5	78%	30-130%
118-79-6	2,4,6-Tribromophenol	79%	30-130%
4165-60-0	Nitrobenzene-d5	63%	30-130%
321-60-8	2-Fluorobiphenyl	77%	30-130%
1718-51-0	Terphenyl-d14	82%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

7.2.1

7

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39279-BS	I91141.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2390	1850	77	40-140
208-96-8	Acenaphthylene	2390	1630	68	40-140
120-12-7	Anthracene	2390	1900	79	40-140
56-55-3	Benzo(a)anthracene	2390	2370	99	40-140
50-32-8	Benzo(a)pyrene	2390	2080	87	40-140
205-99-2	Benzo(b)fluoranthene	2390	2590	108	40-140
191-24-2	Benzo(g,h,i)perylene	2390	2150	90	40-140
207-08-9	Benzo(k)fluoranthene	2390	1960	82	40-140
218-01-9	Chrysene	2390	1970	82	40-140
53-70-3	Dibenzo(a,h)anthracene	2390	2310	97	40-140
206-44-0	Fluoranthene	2390	2080	87	40-140
86-73-7	Fluorene	2390	1860	78	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2390	2260	94	40-140
90-12-0	1-Methylnaphthalene	2390	1860	78	40-140
91-57-6	2-Methylnaphthalene	2390	1910	80	40-140
85-01-8	Phenanthrene	2390	1880	79	40-140
129-00-0	Pyrene	2390	2070	86	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	40%	15-110%
4165-62-2	Phenol-d5	40%	15-110%
118-79-6	2,4,6-Tribromophenol	43%	15-110%
4165-60-0	Nitrobenzene-d5	83%	30-130%
321-60-8	2-Fluorobiphenyl	77%	30-130%
1718-51-0	Terphenyl-d14	93%	30-130%

* = Outside of Control Limits.

7.2.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-MS	F75248.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
OP39278-MSD	F75251.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
MC32591-1	F75252.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
MC32591-1 [a]	F75277.D	1	08/12/14	WK	08/06/14	OP39278	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

CAS No.	Compound	MC32591-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		2570	1150	45	2580	1860	72	47* [b]	30-130/30
95-57-8	2-Chlorophenol	ND		2570	1750	68	2580	2210	86	23	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		2570	1580	62	2580	1950	76	21	30-130/30
120-83-2	2,4-Dichlorophenol	ND		2570	1660	65	2580	2010	78	19	30-130/30
105-67-9	2,4-Dimethylphenol	ND		2570	1580	62	2580	1950	76	21	30-130/30
51-28-5	2,4-Dinitrophenol	ND		2570	543	21* [c]	2580	789	31	67* [b]	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		2570	874	34	2580	1100	43	23	30-130/30
95-48-7	2-Methylphenol	ND		2570	1730	67	2580	2090	81	19	30-130/30
	3&4-Methylphenol	ND		5130	3470	68	5160	4190	81	19	30-130/30
88-75-5	2-Nitrophenol	ND		2570	1640	64	2580	2040	79	22	30-130/30
100-02-7	4-Nitrophenol	ND		2570	1330	52	2580	1610	62	19	30-130/30
87-86-5	Pentachlorophenol	ND		2570	2090	81	2580	2550	99	20	30-130/30
108-95-2	Phenol	ND		2570	1600	62	2580	2150	83	29	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		2570	1850	72	2580	2360	92	24	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		2570	1750	68	2580	2220	86	24	30-130/30
62-53-3	Aniline	ND		2570	1380	54	2580	1810	70	27	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		2570	1720	67	2580	2200	85	24	40-140/30
85-68-7	Butyl benzyl phthalate	ND		2570	2290	89	2580	2760	107	19	40-140/30
100-51-6	Benzyl Alcohol	ND		2570	1520	59	2580	2030	79	29	40-140/30
91-58-7	2-Chloronaphthalene	ND		2570	1810	70	2580	2290	89	23	40-140/30
106-47-8	4-Chloroaniline	ND		2570	1520	59	2580	1960	76	25	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		2570	1370	53	2580	1770	69	25	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		2570	1730	67	2580	2230	86	25	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		2570	2370	92	2580	3040	118	25	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		2570	1630	63	2580	1950	76	18	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		2570	1730	67	2580	2180	85	23	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		2570	1670	65	2580	2100	81	23	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		2570	1550	60	2580	1960	76	23	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		2570	1870	73	2580	2280	88	20	40-140/30
132-64-9	Dibenzofuran	ND		2570	1640	64	2580	2040	79	22	40-140/30
84-74-2	Di-n-butyl phthalate	ND		2570	1880	73	2580	2380	92	23	40-140/30
117-84-0	Di-n-octyl phthalate	ND		2570	2180	85	2580	2650	103	19	40-140/30
84-66-2	Diethyl phthalate	ND		2570	1830	71	2580	2210	86	19	40-140/30
131-11-3	Dimethyl phthalate	ND		2570	1770	69	2580	2190	85	21	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		2570	2270	88	2580	2780	108	20	40-140/30
118-74-1	Hexachlorobenzene	ND		2570	1690	66	2580	2150	83	24	40-140/30

* = Outside of Control Limits.

7.3.1

7

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39278-MS	F75248.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
OP39278-MSD	F75251.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
MC32591-1	F75252.D	1	08/11/14	WK	08/06/14	OP39278	MSF3311
MC32591-1 [a]	F75277.D	1	08/12/14	WK	08/06/14	OP39278	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32591-1, MC32591-2

7.3.1

CAS No.	Compound	MC32591-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		2570	612	24* d	2580	763	30* d	22	40-140/30
67-72-1	Hexachloroethane	ND		2570	1510	59	2580	1920	74	24	40-140/30
78-59-1	Isophorone	ND		2570	1360	53	2580	1710	66	23	40-140/30
88-74-4	2-Nitroaniline	ND		2570	1870	73	2580	2430	94	26	40-140/30
99-09-2	3-Nitroaniline	ND		2570	1720	67	2580	2150	83	22	40-140/30
100-01-6	4-Nitroaniline	ND		2570	1710	67	2580	2190	85	25	40-140/30
98-95-3	Nitrobenzene	ND		2570	1290	50	2580	1620	63	23	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		2570	1480	58	2580	1910	74	25	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		2570	1540	60	2580	1980	77	25	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		2570	1690	66	2580	2150	83	24	40-140/30
110-86-1	Pyridine	ND		2570	1280	50	2580	1660	64	26	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32591-1	MC32591-1	Limits
367-12-4	2-Fluorophenol	65%	82%	32%	32%	30-130%
4165-62-2	Phenol-d5	61%	77%	33%	32%	30-130%
118-79-6	2,4,6-Tribromophenol	68%	84%	62%	60%	30-130%
4165-60-0	Nitrobenzene-d5	52%	63%	25%* e	25%* e	30-130%
321-60-8	2-Fluorobiphenyl	64%	78%	34%	31%	30-130%
1718-51-0	Terphenyl-d14	72%	84%	70%	68%	30-130%

(a) Confirmation run for surrogate recoveries.
(b) High RPD due to possible matrix interference and/or sample heterogeneity.
(c) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(d) Outside control limits. Blank Spike meets program technical requirements.
(e) Outside control limits due to possible matrix interference. Confirmed by reanalysis.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39279-MS	I91142.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393
OP39279-MSD	I91143.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393
MC32591-1	I91144.D	1	08/11/14	MR	08/06/14	OP39279	MSI3393

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32591-1, MC32591-2

7.3.2

CAS No.	Compound	MC32591-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	ND		2570	1670	65	2580	2110	82	23	40-140/30
208-96-8	Acenaphthylene	ND		2570	1480	58	2580	1840	71	22	40-140/30
120-12-7	Anthracene	ND		2570	1740	68	2580	2180	85	22	40-140/30
56-55-3	Benzo(a)anthracene	ND		2570	2150	84	2580	2730	106	24	40-140/30
50-32-8	Benzo(a)pyrene	ND		2570	1890	74	2580	2380	92	23	40-140/30
205-99-2	Benzo(b)fluoranthene	ND		2570	2250	88	2580	2770	107	21	40-140/30
191-24-2	Benzo(g,h,i)perylene	3.1	J	2570	1980	77	2580	2480	96	22	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		2570	1860	72	2580	2340	91	23	40-140/30
218-01-9	Chrysene	ND		2570	1790	70	2580	2270	88	24	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		2570	2110	82	2580	2660	103	23	40-140/30
206-44-0	Fluoranthene	ND		2570	1900	74	2580	2360	92	22	40-140/30
86-73-7	Fluorene	ND		2570	1680	65	2580	2120	82	23	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		2570	2060	80	2580	2590	100	23	40-140/30
90-12-0	1-Methylnaphthalene	ND		2570	1680	65	2580	2100	81	22	40-140/30
91-57-6	2-Methylnaphthalene	ND		2570	1730	67	2580	2150	83	22	40-140/30
85-01-8	Phenanthrene	1.6	JB	2570	1710	67	2580	2150	83	23	40-140/30
129-00-0	Pyrene	ND		2570	1890	74	2580	2360	92	22	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32591-1	Limits
4165-60-0	Nitrobenzene-d5	68%	82%	32%	30-130%
321-60-8	2-Fluorobiphenyl	64%	78%	35%	30-130%
1718-51-0	Terphenyl-d14	77%	95%	82%	30-130%

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3311-CC3270	Injection Date:	08/11/14
Lab File ID:	F75239.D	Injection Time:	10:00
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	154060	2.89	555619	3.91	343042	5.38	582020	6.62	637721	8.88	614006	10.23
Upper Limit [a]	308120	3.39	1111238	4.41	686084	5.88	1164040	7.12	1275442	9.38	1228012	10.73
Lower Limit [b]	77030	2.39	277810	3.41	171521	4.88	291010	6.12	318861	8.38	307003	9.73
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39278-MB	212626	2.88	756684	3.91	456547	5.38	750650	6.61	783503	8.87	721996	10.23
OP39278-BS	209713	2.88	755773	3.91	446693	5.38	752496	6.62	772075	8.87	708071	10.23
ZZZZZZ	158140	2.88	575302	3.90	356057	5.38	613659	6.61	668253	8.87	674909	10.23
ZZZZZZ	154045	2.88	568936	3.90	349295	5.38	605694	6.61	658231	8.87	667129	10.23
ZZZZZZ	154155	2.88	580174	3.90	355614	5.38	621128	6.61	677700	8.87	655056	10.23
ZZZZZZ	155391	2.88	580207	3.91	351716	5.39	605209	6.62	666575	8.87	679647	10.23
ZZZZZZ	156791	2.88	557078	3.91	340722	5.39	579244	6.62	634164	8.87	660311	10.23
OP39278-MS	198551	2.89	695238	3.91	408339	5.38	676085	6.62	668777	8.87	684879	10.23
OP39278-MSD	195312	2.88	686010	3.91	401254	5.38	665423	6.62	681302	8.88	716894	10.23
MC32591-1	155344	2.88	569042	3.90	349017	5.38	592479	6.61	662420	8.87	708209	10.23
MC32591-2	199558	2.88	705977	3.90	415337	5.38	682725	6.61	722752	8.87	764266	10.23
OP39320-MB	192248	2.88	671058	3.90	393479	5.38	660888	6.61	696067	8.87	721666	10.23
OP39320-BS	196260	2.89	688069	3.91	400475	5.38	676931	6.62	711581	8.88	753419	10.23
OP39320-BSD	187654	2.89	666594	3.91	388221	5.38	647388	6.62	682922	8.87	736021	10.23
OP39320-MS	201647	2.89	707853	3.91	412939	5.38	695324	6.62	731114	8.87	872717	10.23
OP39320-MSD	182861	2.89	642013	3.91	381491	5.38	641818	6.61	685894	8.87	747056	10.23
MC32537-28	163093	2.88	644515	3.90	347396	5.38	591921	6.61	662923	8.87	790092	10.23
ZZZZZZ	150557	2.88	557252	3.90	345110	5.38	608378	6.62	690896	8.89	758940	10.26
ZZZZZZ	163598	2.88	586927	3.91	351776	5.38	585527	6.61	653203	8.87	717214	10.23
ZZZZZZ	206709	2.88	651097	3.91	388158	5.38	651040	6.61	721103	8.87	775337	10.23
ZZZZZZ	171768	2.88	616455	3.91	413790	5.38	646132	6.61	748680	8.87	798543	10.23
ZZZZZZ	211132	2.89	746422	3.91	437625	5.39	727884	6.61	746834	8.87	905804	10.23

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

74.1

Semivolatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3312-CC3270	Injection Date:	08/12/14
Lab File ID:	F75272.D	Injection Time:	08:24
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	158860	2.86	561602	3.88	326601	5.36	563071	6.59	588592	8.85	654175	10.19
Upper Limit [a]	317720	3.36	1123204	4.38	653202	5.86	1126142	7.09	1177184	9.35	1308350	10.69
Lower Limit [b]	79430	2.36	280801	3.38	163301	4.86	281536	6.09	294296	8.35	327088	9.69
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
ZZZZZZ	211132	2.86	861751	3.88	493229	5.35	780219	6.58	743886	8.84	673193	10.19
ZZZZZZ	191298	2.85	688330	3.88	360511	5.35	607421	6.59	659638	8.85	702682	10.20
ZZZZZZ	197299	2.86	678737	3.88	426037	5.35	609053	6.58	619227	8.84	658618	10.19
ZZZZZZ	264373	2.86	885193	3.88	489024	5.35	859275	6.59	832484	8.84	905628	10.20
MC32591-1 [c]	204048	2.86	687938	3.88	442302	5.35	692541	6.58	665979	8.84	743574	10.19
OP39310-MB	247549	2.86	840763	3.87	519662	5.35	705770	6.58	683403	8.84	764309	10.19
OP39310-BS	245515	2.86	835713	3.88	461982	5.36	710278	6.59	769600	8.84	694759	10.19
OP39310-MS	246109	2.86	936785	3.88	511970	5.35	694864	6.59	653146	8.84	666218	10.19
OP39310-MSD	286079	2.85	889060	3.88	434959	5.35	740173	6.59	691828	8.84	685699	10.19
MC32660-1	282921	2.86	964722	3.88	475758	5.35	722013	6.58	673254	8.84	676698	10.19
ZZZZZZ	291714	2.86	868398	3.88	483130	5.35	867710	6.58	701225	8.84	822326	10.19
ZZZZZZ	306752	2.86	954239	3.88	470412	5.36	723104	6.58	767983	8.84	714403	10.19
ZZZZZZ	290375	2.85	875967	3.87	484991	5.35	840076	6.58	684145	8.84	675792	10.19
ZZZZZZ	281827	2.85	971926	3.87	528494	5.35	700274	6.58	660980	8.84	661431	10.19
ZZZZZZ	254569	2.86	858188	3.88	469325	5.35	805412	6.59	775079	8.84	770699	10.19
ZZZZZZ	233358	2.85	809979	3.87	455758	5.35	788384	6.58	704593	8.83	652185	10.19
ZZZZZZ	260435	2.86	878169	3.87	449477	5.35	693485	6.58	686474	8.84	690386	10.19
ZZZZZZ	264005	2.86	912551	3.88	463816	5.35	733312	6.58	737236	8.84	673801	10.19
OP39207-MB	195577	2.86	652877	3.87	440515	5.35	792384	6.58	759968	8.84	877505	10.19
OP39207-BS	220946	2.86	680389	3.88	380392	5.35	618225	6.59	677963	8.84	815043	10.19
OP39207-MS	219822	2.86	743401	3.88	408268	5.35	710392	6.59	880572	8.84	889693	10.19
OP39207-MSD	235956	2.86	792294	3.88	397925	5.35	643148	6.59	700885	8.84	749691	10.19
MC32300-11	192039	2.85	761944	3.87	395519	5.35	653984	6.58	852331	8.84	867680	10.19
ZZZZZZ	177577	2.86	765305	3.87	476864	5.35	812902	6.58	891770	8.84	912501	10.19
ZZZZZZ	241084	2.86	843681	3.88	497521	5.35	789895	6.58	783692	8.84	838646	10.19
ZZZZZZ	197296	2.86	709227	3.87	404804	5.35	710726	6.58	875933	8.84	817885	10.19
ZZZZZZ	228036	2.86	784337	3.87	454727	5.35	723003	6.58	717010	8.84	773058	10.19
ZZZZZZ	239661	2.86	818211	3.88	472242	5.35	785905	6.58	851168	8.84	804733	10.19

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

7.4.2

Semivolatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3312-CC3270	Injection Date:	08/12/14
Lab File ID:	F75272.D	Injection Time:	08:24
Instrument ID:	GCMSF	Method:	SW846 8270D

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.
(c) Confirmation run for surrogate recoveries.

7.4.2

7

Semivolatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3393-CC3386	Injection Date:	08/11/14
Lab File ID:	I91121.D	Injection Time:	08:08
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	426092	4.15	926295	5.20	490431	6.74	842432	8.13	597472	10.91	1583703	12.40
Upper Limit [a]	852184	4.65	1852590	5.70	980862	7.24	1684864	8.63	1194944	11.41	3167406	12.90
Lower Limit [b]	213046	3.65	463148	4.70	245216	6.24	421216	7.63	298736	10.41	791852	11.90
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39297-MB	503416	4.15	1103967	5.20	584900	6.74	991638	8.13	707438	10.90	1898363	12.40
OP39297-BS	506767	4.15	1109980	5.20	585362	6.74	998433	8.13	708850	10.91	1836273	12.41
OP39297-MS	485450	4.15	1077797	5.20	572438	6.74	990069	8.13	720752	10.91	1872921	12.41
OP39297-MSD	526073	4.15	1169183	5.20	619370	6.74	1055033	8.13	756467	10.91	1949509	12.41
MC32616-11	502555	4.15	1114394	5.20	589785	6.74	1009416	8.13	726450	10.90	1939968	12.40
ZZZZZZ	532918	4.16	1155619	5.21	610678	6.74	1037348	8.13	719325	10.91	1873854	12.40
ZZZZZZ	516346	4.15	1136457	5.20	608334	6.74	1033657	8.13	757920	10.91	2014652	12.41
ZZZZZZ	522495	4.15	1144091	5.20	610365	6.74	1032010	8.13	738991	10.91	1947328	12.41
ZZZZZZ	539567	4.15	1179244	5.20	628617	6.74	1064327	8.13	761607	10.91	2029213	12.41
ZZZZZZ	509269	4.15	1116122	5.20	587326	6.74	1004700	8.13	724216	10.91	1878710	12.41
ZZZZZZ	505331	4.15	1107368	5.20	587081	6.74	1001111	8.13	714289	10.91	1884704	12.41
ZZZZZZ	506250	4.15	1113037	5.20	583729	6.74	995061	8.13	704588	10.91	1839609	12.41
ZZZZZZ	490018	4.15	1078498	5.20	578536	6.74	988537	8.13	717860	10.91	1900620	12.41
ZZZZZZ	508742	4.15	1110243	5.20	589755	6.74	1002005	8.13	713185	10.91	1888477	12.41
ZZZZZZ	511522	4.15	1130525	5.20	597325	6.74	1024807	8.13	740981	10.91	1956925	12.41
ZZZZZZ	500741	4.15	1100569	5.20	582769	6.74	995007	8.13	717629	10.91	1902230	12.41
ZZZZZZ	499323	4.15	1099995	5.20	577430	6.74	993366	8.13	720448	10.91	1889963	12.41
OP39279-MB	459079	4.15	1015058	5.20	533797	6.74	917328	8.13	642171	10.91	1666860	12.41
OP39279-BS	493935	4.15	1088984	5.20	577431	6.74	994159	8.13	699861	10.91	1766508	12.41
OP39279-MS	456172	4.15	1013102	5.20	542186	6.74	934316	8.13	650221	10.91	1688964	12.41
OP39279-MSD	454590	4.15	1003820	5.20	530364	6.74	906567	8.13	633822	10.91	1652719	12.41
MC32591-1	400320	4.15	882407	5.20	463437	6.74	788328	8.13	545603	10.90	1497300	12.40
MC32591-2	503818	4.15	1108949	5.20	584025	6.74	988409	8.13	667898	10.91	1722920	12.40
ZZZZZZ	464731	4.15	1015369	5.20	531140	6.74	895096	8.13	638162	10.91	1655266	12.41
ZZZZZZ	426242	4.15	936531	5.20	487870	6.74	820753	8.13	570084	10.90	1524209	12.40
ZZZZZZ	417043	4.15	922206	5.20	477322	6.74	801194	8.13	531323	10.90	1403896	12.40
ZZZZZZ	546342	4.15	1199859	5.20	616932	6.74	1007793	8.13	605347	10.91	1502297	12.41
ZZZZZZ	493265	4.15	1088844	5.20	568782	6.74	942209	8.13	614282	10.91	1547989	12.41

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

7.4.3

Semivolatile Internal Standard Area Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3393-CC3386	Injection Date:	08/11/14
Lab File ID:	I91121.D	Injection Time:	08:08
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.3

7

Semivolatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC32591-1	F75277.D	32	32	60	25* [a]	31	68
MC32591-1	F75252.D	32	33	62	25* [a]	34	70
MC32591-2	F75253.D	69	67	78	53	70	83
OP39278-BS	F75241.D	80	78	79	63	77	82
OP39278-MB	F75240.D	81	76	76	64	76	84
OP39278-MS	F75248.D	65	61	68	52	64	72
OP39278-MSD	F75251.D	82	77	84	63	78	84

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

(a) Outside control limits due to possible matrix interference. Confirmed by reanalysis.

7.5.1

Semivolatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32591-1	I91144.D	32	35	82
MC32591-2	I91145.D	71	70	96
OP39279-BS	I91141.D	83	77	93
OP39279-MB	I91140.D	81	76	95
OP39279-MS	I91142.D	68	64	77
OP39279-MSD	I91143.D	82	78	95

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

New England ACCUTEST LABORATORIES

GC Volatiles

QC Data Summaries

8

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-MB	BK39938.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-4

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	115%	36-173%
460-00-4	Bromofluorobenzene (S)	107%	36-173%

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-MB	BK39961.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.72	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.60	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	158%	61-167%
460-00-4	Bromofluorobenzene (S)	163%	61-167%

8.1.2

Method Blank Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-MB	AB85228.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32591-1, MC32591-2

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	95%	61-116%

8.1.3

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-BS	BK39939.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-4

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.085	120	60-140
106-93-4	1,2-Dibromoethane	0.071	0.083	117	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	110%	36-173%
460-00-4	Bromofluorobenzene (S)	118%	36-173%

8.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-BS	BK39962.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-1, MC32591-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	33.1	37.1	112	59-142
106-93-4	1,2-Dibromoethane	33.1	28.4	86	56-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	135%	61-167%
460-00-4	Bromofluorobenzene (S)	123%	61-167%

8.2.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-BSP	AB85229.D	1	08/07/14	AF	n/a	n/a	GAB4535
GAB4535-BSD	AB85230.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32591-1, MC32591-2

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	32.0	98	31.9	98	0	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	98%	97%	61-116%

8.3.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39247-MS	BK39940.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298
OP39247-MSD	BK39941.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298
MC32300-19	BK39942.D	1	08/05/14	NK	08/04/14	OP39247	GBK1298

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-4

CAS No.	Compound	MC32300-19 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.087	123	0.071	0.084	118	4	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.082	115	0.071	0.078	110	5	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32300-19	Limits
460-00-4	Bromofluorobenzene (S)	89%	88%	92%	36-173%
460-00-4	Bromofluorobenzene (S)	100%	104%	106%	36-173%

8.4.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39257-MS	BK39963.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
OP39257-MSD	BK39964.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299
MC32521-1	BK39965.D	1	08/07/14	NK	08/05/14	OP39257	GBK1299

The QC reported here applies to the following samples: Method: SW846 8011

MC32591-1, MC32591-2

CAS No.	Compound	MC32521-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		37.4	58.5	156	37.7	57.7	153	1	40-156/27
106-93-4	1,2-Dibromoethane	ND		37.4	46.9	125	37.7	48.5	129	3	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32521-1	Limits
460-00-4	Bromofluorobenzene (S)	159%	162%	155%	61-167%
460-00-4	Bromofluorobenzene (S)	152%	158%	155%	61-167%

8.4.2

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32521-1MS	AB85233.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1MSD	AB85234.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1	AB85232.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32591-1, MC32591-2

CAS No.	Compound	MC32521-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	ND		94.1	94.9	101	94.1	95.1	101	0	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC32521-1	Limits
	2,3,4-Trifluorotoluene	101%	100%	98%	61-116%

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32591-4	BK39951.D	90	104
OP39247-BS	BK39939.D	110	118
OP39247-MB	BK39938.D	115	107
OP39247-MS	BK39940.D	89	100
OP39247-MSD	BK39941.D	88	104

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32591-1	BK39984.D	105	141
MC32591-2	BK39985.D	104	138
OP39257-BS	BK39962.D	135	123
OP39257-MB	BK39961.D	158	163
OP39257-MS	BK39963.D	159	152
OP39257-MSD	BK39964.D	162	158

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC32591-1	AB85246.D	94
MC32591-2	AB85247.D	94
GAB4535-BSD	AB85230.D	97
GAB4535-BSP	AB85229.D	98
GAB4535-MB	AB85228.D	95
MC32521-1MS	AB85233.D	101
MC32521-1MSD	AB85234.D	100

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.3

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1298-ICC1298	Injection Date:	08/05/14
Lab File ID:	BK39934.D	Injection Time:	09:17
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.36	4.38

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39247-MB	BK39938.D	08/05/14	10:34	4.36	4.38
OP39247-BS	BK39939.D	08/05/14	10:54	4.36	4.38
OP39247-MS	BK39940.D	08/05/14	11:13	4.36	4.38
OP39247-MSD	BK39941.D	08/05/14	11:32	4.36	4.38
MC32300-19	BK39942.D	08/05/14	11:52	4.36	4.38
ZZZZZZ	BK39943.D	08/05/14	12:11	4.36	4.37
ZZZZZZ	BK39944.D	08/05/14	12:30	4.36	4.38
ZZZZZZ	BK39945.D	08/05/14	12:49	4.36	4.38
ZZZZZZ	BK39946.D	08/05/14	13:09	4.36	4.38
ZZZZZZ	BK39947.D	08/05/14	13:28	4.36	4.38

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1298-CC1298	Injection Date:	08/05/14
Lab File ID:	BK39948.D	Injection Time:	13:47
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.36	4.37

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
ZZZZZZ	BK39949.D	08/05/14	14:07	0.00	0.00
MC32591-4	BK39951.D	08/05/14	14:45	4.36	4.37
GBK1298-ECC129	BK39952.D	08/05/14	15:05	4.36	4.37

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1299-CC1299	Injection Date:	08/07/14
Lab File ID:	BK39960.D	Injection Time:	08:31
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.27	4.29

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39257-MB	BK39961.D	08/07/14	09:07	4.27	4.28
OP39257-BS	BK39962.D	08/07/14	09:26	4.27	4.28
OP39257-MS	BK39963.D	08/07/14	09:46	4.27	4.28
OP39257-MSD	BK39964.D	08/07/14	10:05	4.27	4.28
MC32521-1	BK39965.D	08/07/14	10:24	4.27	4.28
ZZZZZZ	BK39966.D	08/07/14	10:44	4.27	4.28
ZZZZZZ	BK39967.D	08/07/14	11:03	4.26	4.28
ZZZZZZ	BK39968.D	08/07/14	11:22	4.27	4.28
ZZZZZZ	BK39969.D	08/07/14	11:42	4.27	4.28
ZZZZZZ	BK39970.D	08/07/14	12:01	4.27	4.28

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1299-CC1299	Injection Date:	08/07/14
Lab File ID:	BK39982.D	Injection Time:	15:54
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.27	4.28

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
ZZZZZZ	BK39983.D	08/07/14	16:13	4.27	4.28
MC32591-1	BK39984.D	08/07/14	16:33	4.27	4.28
MC32591-2	BK39985.D	08/07/14	16:52	4.27	4.28
GBK1299-ECC129	BK39986.D	08/07/14	17:12	4.27	4.28

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227A.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.5

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.6

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85237.D	Injection Time:	14:01
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85238.D	08/07/14	14:38	20.33
ZZZZZZ	AB85239.D	08/07/14	15:16	20.33
ZZZZZZ	AB85240.D	08/07/14	15:54	20.33
ZZZZZZ	AB85241.D	08/07/14	16:31	20.32
ZZZZZZ	AB85242.D	08/07/14	17:08	20.33
ZZZZZZ	AB85243.D	08/07/14	17:45	20.33
ZZZZZZ	AB85244.D	08/07/14	18:22	20.33
ZZZZZZ	AB85245.D	08/07/14	19:00	20.32
MC32591-1	AB85246.D	08/07/14	19:38	20.33
MC32591-2	AB85247.D	08/07/14	20:16	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.7

GC Surrogate Retention Time Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85237A.D	Injection Time:	14:01
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85238.D	08/07/14	14:38	20.33
ZZZZZZ	AB85239.D	08/07/14	15:16	20.33
ZZZZZZ	AB85240.D	08/07/14	15:54	20.33
ZZZZZZ	AB85241.D	08/07/14	16:31	20.32
ZZZZZZ	AB85242.D	08/07/14	17:08	20.33
ZZZZZZ	AB85243.D	08/07/14	17:45	20.33
ZZZZZZ	AB85244.D	08/07/14	18:22	20.33
ZZZZZZ	AB85245.D	08/07/14	19:00	20.32
MC32591-1	AB85246.D	08/07/14	19:38	20.33
MC32591-2	AB85247.D	08/07/14	20:16	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.8

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General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC32591
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC32591-1 Analyzed: 07-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE46-080414(18-22')

Wet Weight (Total)	24.788	g
Tare Weight	16.952	g
Dry Weight (Total)	24.453	g
Solids, Percent	95.7	%

Sample: MC32591-2 Analyzed: 07-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE46-080414(18-22')DUP

Wet Weight (Total)	28.235	g
Tare Weight	18.48	g
Dry Weight (Total)	27.847	g
Solids, Percent	96	%

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC32628

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 9/4/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE-42-080514 (32-34')	TB-080514-HCL
TB-080514-ST	

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

No, sample SVE-45-080514 (26-30') and corresponding matrix spike/matrix spike duplicate listed on the COC were cancelled on August 6, 2014 per URS request. To meet QA/QC sample requirements, a matrix spike/matrix spike duplicate was collected on August 20, 2014 and is reported in SDG MC33045.

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated VOC and SVOC LCS recoveries were outside evaluation criteria. Additionally, the initial calibration verification recovery for 1,4-dioxane and acetone exceeded 30 percent difference (%D). Continuing calibration recovery for 1,2-dibromo-3-chloropropane and 1,2-dibromoethane exceeded 15%D.

The cooler receipt form indicated samples were received by the laboratory at 0.8°C which is outside temperature criteria 4°C ± 2°C. All samples were received in good condition; no qualification of data was required.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

No

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSU968-BS	VOCs	Dichlorodifluoromethane	**66**	NA	70-130
MSU968-BS	VOCs	Trichlorofluoromethane	**63**	NA	70-130
OP39292-BS/BSD	SVOCs	Benzoic acid	104/36	**94**	30-130/30
OP39292-BS/BSD	SVOCs	bis(2-Chloroisopropyl)ether	120/63	**59**	40-140/30
OP39292-BS/BSD	SVOCs	Hexachlorocyclopentadiene	**29**/47	**51**	40-140/30

Analytical data that required qualification based on LCS/LCSD data are included in the table below. Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. LCS MSU968-BS is associated with the trip blank; blanks are quality control samples and are not qualified.

Sample ID	Parameter	Analyte	Qualification
SVE-42-080514 (32-34')	SVOCs	Hexachlorocyclopentadiene	**UJ**

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

Yes

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

No, sample SVE-45-080514 (26-30') and corresponding matrix spike/matrix spike duplicate listed on the COC were cancelled on August 6, 2014 per URS request. To meet QA/QC sample requirements, a matrix spike/matrix spike duplicate was collected on August 20, 2014 and is reported in SDG MC33045.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

Yes

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

No

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; samples analyzed did not require dilution.

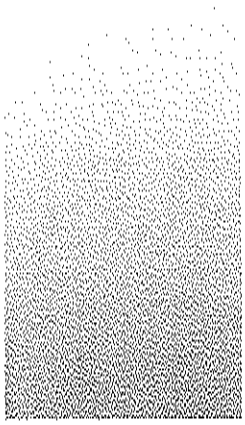
12.0 Additional Qualifications

Were additional qualifications applied?

No

New England ACCUTEST LABORATORIES

08/22/14



Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

21562973.19200

Accutest Job Number: MC32628

Sampling Date: 08/05/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **86**

Reviewed on 9/4/2014

Reza Pand
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

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Sample Summary

Shell Oil

Job No: MC32628

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC32628-2	08/05/14	16:45 EA	08/06/14	SO	Soil	SVE42-080514(32-34')
MC32628-3	08/05/14	00:00 EA	08/06/14	AQ	Trip Blank Water	TB-080514-HCL
MC32628-4	08/05/14	00:00 EA	08/06/14	AQ	Trip Blank Water	TB-080514-ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

ACCUTEST LABORATORIES

N

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC32628
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Centr	Report Date	8/20/2014 5:29:33 PM

1 Sample(s), 2 Trip Blank(s) were collected on 08/05/2014 and were received at Accutest on 08/06/2014 properly preserved, at 0.8 Deg. C and intact. These Samples received an Accutest job number of MC32628. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Sample Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix AQ	Batch ID: MSU968

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC33042-1MS, MC33042-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Blank Spike Recovery(s) for Dichlorodifluoromethane, Trichlorofluoromethane are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for Bromomethane, 2-Chloroethyl vinyl ether, Chloroethane, 2-Hexanone, Vinyl chloride are outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike has internal standard outside control limits. Outside control limits due to possible matrix interference. Confirmed by MS/MSD.
- MC32850-1MS for Acetone outside control limits : Outside control limits due to possible matrix interference. Refer to Blank Spike.
- MC32850-1MSD for Acetone, 2-Chloroethyl vinyl ether, Chloroethane, 2-Hexanone, Vinyl chloride : Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Initial calibration verification MSU957-ICV957 for 1,4-dioxane exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.

Matrix SO	Batch ID: MSK2566

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32860-8MS, MC32860-8MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Matrix Spike Recovery(s) for 1,4-Dioxane, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 1,4-Dioxane, Vinyl Acetate, Acetone are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for Acetone are outside control limits for sample MC32860-8MSD. High RPD due to possible matrix interference and/or sample non-homogeneity.
- Initial calibration verification MSK2552-ICV2552 for acetone (56.8%) exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.

Extractables by GCMS By Method SW846 8270D

Matrix SO	Batch ID: OP39292

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32628-2MS, MC32628-2MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- OP39292-BS Recovery(s) for Hexachlorocyclopentadiene are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2,4-Dinitrophenol, 4,6-Dinitro-o-cresol are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2,4-Dinitrophenol, 4,6-Dinitro-o-cresol, Pyridine are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for Hexachloroethane are outside control limits for sample OP39292-MSD. High RPD due to possible matrix interference and/or sample heterogeneity.
- RPD OP39292-BSD for bis(2-Chloroisopropyl)ether: Analyte recovery satisfactory.
- RPD of OP39292-BSD for Benzoic acid, Hexachlorocyclopentadiene: Outside control limits. Blank Spike meets program technical requirements.
- OP39292-MS/MSD for Benzoic acid, Hexachlorocyclopentadiene: Outside control limits. Blank Spike meets program technical requirements.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix SO	Batch ID: OP39293

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32628-2MS, MC32628-2MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Volatiles by GC By Method SW846 8011

Matrix AQ	Batch ID: OP39418

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32700-7MS, MC32700-7MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Continuing calibration check standard GBK1303-ECC1303 for 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane exceed 15% Dev (response bias high). Associated samples are non-detect for these analytes.
- All samples were analyzed within the recommended method holding time.

Matrix SO	Batch ID: OP39346

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32707-2MS, MC32707-2MSD were used as the QC samples indicated.

Volatiles by GC By Method SW846 8015

Matrix SO	Batch ID: GAB4535

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32521-1MS, MC32521-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Calibration check standard GAB4536-CC4488 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix SO	Batch ID: GN47895

* Sample(s) MC32549-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC32628).

Summary of Hits

Job Number: MC32628
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/05/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC32628-2	SVE42-080514(32-34')					
n-Butylbenzene		1.46	0.87	0.042	mg/kg	SW846 8260C
Ethylbenzene		1.38	0.35	0.12	mg/kg	SW846 8260C
Isopropylbenzene		0.455 J	0.87	0.029	mg/kg	SW846 8260C
Naphthalene		2.26	0.87	0.069	mg/kg	SW846 8260C
n-Propylbenzene		1.22	0.87	0.026	mg/kg	SW846 8260C
1,2,4-Trimethylbenzene		7.03	0.87	0.25	mg/kg	SW846 8260C
1,3,5-Trimethylbenzene		1.89	0.87	0.26	mg/kg	SW846 8260C
m,p-Xylene		3.41	0.35	0.076	mg/kg	SW846 8260C
o-Xylene		1.83	0.35	0.049	mg/kg	SW846 8260C
Xylene (total)		5.24	0.35	0.038	mg/kg	SW846 8260C
Total TIC, Volatile		45.5 J			mg/kg	
2-Methylnaphthalene		0.0013 J	0.012	0.0011	mg/kg	SW846 8270D BY SIM
TPH-GRO (VOA)		12.2 J	15	2.2	mg/kg	SW846 8015
MC32628-3	TB-080514-HCL					
No hits reported in this sample.						
MC32628-4	TB-080514-ST					
No hits reported in this sample.						

New England ACCUTEST LABORATORIES

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	K81134.D	1	08/15/14	JM	n/a	n/a	MSK2566
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	3.68 g	10.0 ml	100 ul
Run #2			

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	1.7	0.49	mg/kg	
107-02-8	Acrolein	ND	4.3	1.5	mg/kg	
107-13-1	Acrylonitrile	ND	4.3	0.48	mg/kg	
71-43-2	Benzene	ND	0.087	0.059	mg/kg	
108-86-1	Bromobenzene	ND	0.87	0.044	mg/kg	
74-97-5	Bromochloromethane	ND	0.87	0.060	mg/kg	
75-27-4	Bromodichloromethane	ND	0.35	0.036	mg/kg	
75-25-2	Bromoform	ND	0.35	0.062	mg/kg	
74-83-9	Bromomethane	ND	0.35	0.10	mg/kg	
78-93-3	2-Butanone (MEK)	ND	1.7	0.53	mg/kg	
104-51-8	n-Butylbenzene	1.46	0.87	0.042	mg/kg	
135-98-8	sec-Butylbenzene	ND	0.87	0.13	mg/kg	
98-06-6	tert-Butylbenzene	ND	0.87	0.037	mg/kg	
75-15-0	Carbon disulfide	ND	0.87	0.023	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.35	0.038	mg/kg	
108-90-7	Chlorobenzene	ND	0.35	0.027	mg/kg	
75-00-3	Chloroethane	ND	0.87	0.13	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.87	0.22	mg/kg	
67-66-3	Chloroform	ND	0.35	0.029	mg/kg	
74-87-3	Chloromethane	ND	0.87	0.098	mg/kg	
95-49-8	o-Chlorotoluene	ND	0.87	0.033	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.87	0.046	mg/kg	
124-48-1	Dibromochloromethane	ND	0.35	0.056	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.35	0.037	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.35	0.053	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.35	0.060	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.35	0.14	mg/kg	
75-34-3	1,1-Dichloroethane	ND	0.35	0.046	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.35	0.056	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.35	0.072	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.35	0.079	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.35	0.073	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.35	0.073	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.87	0.057	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.87	0.098	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.87	0.046	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.35	0.039	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.35	0.046	mg/kg	
123-91-1	1,4-Dioxane	ND	4.3	3.5	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.87	0.062	mg/kg	
100-41-4	Ethylbenzene	1.38	0.35	0.12	mg/kg	
87-68-3	Hexachlorobutadiene	ND	0.87	0.10	mg/kg	
591-78-6	2-Hexanone	ND	1.7	0.13	mg/kg	
98-82-8	Isopropylbenzene	0.455	0.87	0.029	mg/kg	J
99-87-6	p-Isopropyltoluene	ND	0.87	0.030	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.35	0.032	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.87	0.094	mg/kg	
74-95-3	Methylene bromide	ND	0.87	0.080	mg/kg	
75-09-2	Methylene chloride	ND	0.35	0.092	mg/kg	
91-20-3	Naphthalene	2.26	0.87	0.069	mg/kg	
103-65-1	n-Propylbenzene	1.22	0.87	0.026	mg/kg	
100-42-5	Styrene	ND	0.87	0.030	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.87	0.070	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.35	0.068	mg/kg	
127-18-4	Tetrachloroethene	ND	0.35	0.054	mg/kg	
108-88-3	Toluene	ND	0.87	0.036	mg/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	0.87	0.074	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.87	0.089	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.35	0.038	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.35	0.10	mg/kg	
79-01-6	Trichloroethene	ND	0.35	0.043	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.35	0.069	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.87	0.050	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	7.03	0.87	0.25	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	1.89	0.87	0.26	mg/kg	
108-05-4	Vinyl Acetate	ND	0.87	0.27	mg/kg	
75-01-4	Vinyl chloride	ND	0.35	0.16	mg/kg	
	m,p-Xylene	3.41	0.35	0.076	mg/kg	
95-47-6	o-Xylene	1.83	0.35	0.049	mg/kg	
1330-20-7	Xylene (total)	5.24	0.35	0.038	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	104%		70-130%
2037-26-5	Toluene-D8	102%		70-130%
460-00-4	4-Bromofluorobenzene	115%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
111-84-2	Nonane	13.39	1.8	mg/kg	JN
611-14-3	Benzene, 1-ethyl-2-methyl-	14.61	3.8	mg/kg	JN
622-96-8	Benzene, 1-ethyl-4-methyl-	14.93	2.3	mg/kg	JN
526-73-8	Benzene, 1,2,3-trimethyl-	15.63	2.5	mg/kg	JN
1120-21-4	Undecane	16.10	4.3	mg/kg	JN
527-53-7	Benzene, 1,2,3,5-tetramethyl-	16.25	1.6	mg/kg	JN
934-74-7	Benzene, 1-ethyl-3,5-dimethyl-	16.32	2.9	mg/kg	JN
535-77-3	Benzene, 1-methyl-3-(1-methylethyl)-	16.64	1.8	mg/kg	JN
934-80-5	Benzene, 4-ethyl-1,2-dimethyl-	16.82	2.9	mg/kg	JN
	Unknown Benzene	16.87	4	mg/kg	JN
1005-64-7	Benzene, 1-butenyl-, (E)-	17.12	2.4	mg/kg	JN
112-40-3	Dodecane	17.26	4.5	mg/kg	JN
6682-71-9	1H-Indene, 2,3-dihydro-4,7-dimethyl-	17.78	5	mg/kg	JN
629-50-5	Tridecane	18.34	2	mg/kg	JN
91-57-6	Naphthalene, 2-methyl-	19.25	3.7	mg/kg	JN
	Total TIC, Volatile		45.5	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8270D SW846 3546	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75205.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
Run #2							

	Initial Weight	Final Volume
Run #1	20.5 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.59	0.073	mg/kg	
95-57-8	2-Chlorophenol	ND	0.29	0.013	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.59	0.015	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.59	0.017	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.59	0.096	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.2	0.15	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.59	0.073	mg/kg	
95-48-7	2-Methylphenol	ND	0.59	0.023	mg/kg	
	3&4-Methylphenol	ND	0.59	0.029	mg/kg	
88-75-5	2-Nitrophenol	ND	0.59	0.016	mg/kg	
100-02-7	4-Nitrophenol	ND	1.2	0.11	mg/kg	
87-86-5	Pentachlorophenol	ND	0.59	0.041	mg/kg	
108-95-2	Phenol	ND	0.29	0.017	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.59	0.015	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.59	0.014	mg/kg	
62-53-3	Aniline	ND	0.59	0.029	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.29	0.015	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.29	0.012	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.59	0.030	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.29	0.016	mg/kg	
106-47-8	4-Chloroaniline	ND	0.59	0.015	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.29	0.014	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.29	0.018	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.29	0.021	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.29	0.018	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.29	0.013	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.59	0.039	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.59	0.015	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.29	0.029	mg/kg	
132-64-9	Dibenzofuran	ND	0.12	0.016	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.29	0.031	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.29	0.0092	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8270D SW846 3546	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.1

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.29	0.015	mg/kg	
131-11-3	Dimethyl phthalate	ND	0.29	0.017	mg/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.29	0.011	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.29	0.018	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.59	0.15	mg/kg	UJ
67-72-1	Hexachloroethane	ND	0.29	0.014	mg/kg	
78-59-1	Isophorone	ND	0.29	0.014	mg/kg	
88-74-4	2-Nitroaniline	ND	0.59	0.015	mg/kg	
99-09-2	3-Nitroaniline	ND	0.59	0.032	mg/kg	
100-01-6	4-Nitroaniline	ND	0.59	0.015	mg/kg	
98-95-3	Nitrobenzene	ND	0.29	0.016	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.29	0.014	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.29	0.017	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.29	0.018	mg/kg	
110-86-1	Pyridine	ND	0.59	0.029	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	56%		30-130%
4165-62-2	Phenol-d5	52%		30-130%
118-79-6	2,4,6-Tribromophenol	58%		30-130%
4165-60-0	Nitrobenzene-d5	52%		30-130%
321-60-8	2-Fluorobiphenyl	57%		30-130%
1718-51-0	Terphenyl-d14	70%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91197.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395
Run #2							

	Initial Weight	Final Volume
Run #1	20.5 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.0059	0.0010	mg/kg	
208-96-8	Acenaphthylene	ND	0.0059	0.00089	mg/kg	
120-12-7	Anthracene	ND	0.0059	0.0013	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.0059	0.0027	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.0059	0.0023	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.0059	0.0026	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.0059	0.0016	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.0059	0.0018	mg/kg	
218-01-9	Chrysene	ND	0.0059	0.0016	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0059	0.0017	mg/kg	
206-44-0	Fluoranthene	ND	0.0059	0.0017	mg/kg	
86-73-7	Fluorene	ND	0.0059	0.0012	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0059	0.0015	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.012	0.0013	mg/kg	
91-57-6	2-Methylnaphthalene	0.0013	0.012	0.0011	mg/kg	J
85-01-8	Phenanthrene	ND	0.0059	0.0012	mg/kg	
129-00-0	Pyrene	ND	0.0059	0.0018	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	59%		30-130%
321-60-8	2-Fluorobiphenyl	57%		30-130%
1718-51-0	Terphenyl-d14	80%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	YZ91290.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
Run #2							

	Initial Weight	Final Volume
Run #1	30.2 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0030	0.00088	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0030	0.00073	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	112%		61-167%
460-00-4	Bromofluorobenzene (S)	111%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE42-080514(32-34')		
Lab Sample ID:	MC32628-2	Date Sampled:	08/05/14
Matrix:	SO - Soil	Date Received:	08/06/14
Method:	SW846 8015	Percent Solids:	83.0
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85245.D	1	08/07/14	AF	n/a	n/a	GAB4535
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.33 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	12.2	15	2.2	mg/kg	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	98%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080514-HCL		
Lab Sample ID:	MC32628-3	Date Sampled:	08/05/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	U21855.D	1	08/18/14	GK	n/a	n/a	MSU968
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080514-HCL		
Lab Sample ID:	MC32628-3	Date Sampled:	08/05/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080514-HCL		
Lab Sample ID:	MC32628-3	Date Sampled:	08/05/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/06/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	111%		70-130%
2037-26-5	Toluene-D8	101%		70-130%
460-00-4	4-Bromofluorobenzene	108%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080514-ST		
Lab Sample ID:	MC32628-4	Date Sampled:	08/05/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/06/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK40154.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
Run #2							

	Initial Volume	Final Volume
Run #1	36.0 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0059	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	82%		36-173%
460-00-4	Bromofluorobenzene (S)	84%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

Misc. Forms

5

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody

MC-32628

Shell Oil Products Chain Of Custody Record

URS

LAB (LOCATION)
☐ CONCO (_____)
☐ KAS NEX (_____)
☑ OTHER (Accutest Laboratories Northeast, 495 Technology Ctr W Monmouth, MA 01752 (508-481-6200))
☐ TSM (_____)
Lab Vendor #

Please Check Appropriate Box:
☑ ENV. SERVICES ☐ MOTIVA RETAIL ☐ SHELL RETAIL
☐ MOTIVA SC&DA ☐ CONSULTANT ☐ LUBES
☐ SHELL PIPELINE ☐ OTHER

Print Bill To Contact Name: Bob Billman
INCIDENT # (ENV SERVICES): 0 7 2 1 6 6 4 0
☐ CHECK IF NO INCIDENT # APPLIES
DATE: 8/5/2014
PAGE: 1 of 1
PO #:
SAP #: 3 4 0 0 0 1

Shipping Company: URS CORPORATION
Address: 1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300; ST. LOUIS, MO 63110
Project Contact Name & Phone #: Elizabeth Kunkel, Bob Billman
Telephone: 314-429-0100 | Fax: 314-429-0462 | Project Contact Email: bob.billman@urs.com, elizabeth.kunkel@urs.com
Site Address (Street and City): 900 South Central Ave; ROXANA
State: IL
Project Name: 4th St. Extension Well Install / 21562073.19200
Sampler(s) Print & Sign Name(s): MC32628
Turnaround Time (Calendar Days): ☑ STANDARD (10 DAY) ☐ 7 DAYS ☐ 5 DAYS ☐ 2 DAYS ☐ 24 HOURS ☐ RESULTS NEEDED ON (MM/DD/YY)
☐ LA - RWQCB REPORT FORMAT ☐ UST AGENCY:
DELIVERABLES: ☐ LEVEL 1 ☐ LEVEL 2 ☐ LEVEL 3 ☑ LEVEL 4 ☑ OTHER (SPECIFY) EDD
Temperature On Receipt C°: Cooler #1 | Cooler #2 | Cooler #3

SPECIAL INSTRUCTIONS OR NOTES:
* Please include "J" values on Reports.
* Please provide sample receipt upon login.
☑ SHELL CONTRACT RATE APPLIES
☐ STATE REIMBURSEMENT RATE APPLIES
☐ EDD NOT NEEDED
☑ RECEIPT VERIFICATION REQUESTED
☐ PROVIDE EDD DISK

REQUESTED ANALYSIS

FIELD NOTES:
TEMPERATURE ON RECEIPT C°
Container PID Readings or Laboratory Notes

Lab Use Only	Field Sample Identification	Sampling Date	Sampling Time	Matrix	Preservative: HCL	MeOH	H2SO4	NaOH	Other	No. of Cont.	VOC 8260B SL+TICS "Top 15"	VOC 8011 SL	SVOC 8270C SL+TICS	PAH 8270LL	Percent Moisture	TPH-GRO	PID (ppm)	Container PID Readings or Laboratory Notes
1	SVE45-080514 (20-30')	8/5/2014	1130	S				2	5	7	X	X	X	X	X	X	12.7	
2	SVE45-080514 (26-30')	8/5/2014	1130	S				2	5	7	X	X	X	X	X	X	12.7	
FD	SVE45-080514 (26-30')	8/5/2014	1130	S				2	5	7	X	X	X	X	X	X	12.7	
3	SVE42-080514 (32-34')	8/5/2014	1045	S				2	5	7	X	X	X	X	X	X	750	
4	TB-080514 HCL			W	2						X							
5	TB-080514 ST			W					2			X						
																		Loc. 28, 1054
																		1 of 3

Relinquished by (Sampler): [signature] | Received by (Courier): FED EX | Date: 8/5/14 | Time: 1830
Relinquished by (Courier): [signature] | Received by (Courier): [signature] | Date: 8-6-14 | Time: 930
Relinquished by (Signature): | Received by (Signature): | Date: | Time:
Cooler Temp: 3.8°C

5.1 5

MC32628: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC32628 Client: URS Immediate Client Services Action Required: No

Date / Time Received: 8/6/2014 Delivery Method: Client Service Action Required at Login: No

Project: ROXANA No. Coolers: 1 Airbill #'s:

Cooler Security	Y or N		Y or N
1. Custody Seals Present:	[Y]	3. COC Present:	[Y]
2. Custody Seals Intact:	[Y]	4. Smpl Dates/Time OK	[Y]

Cooler Temperature	Y or N
1. Temp criteria achieved:	[Y]
2. Cooler temp verification:	Infared gun
3. Cooler media:	Ice (bag)

Quality Control Preservation	Y or N	N/A
1. Trip Blank present / cooler:	[Y]	[ ]
2. Trip Blank listed on COC:	[Y]	[ ]
3. Samples preserved properly:	[Y]	
4. VOCs headspace free:	[Y]	[ ]

Sample Integrity - Documentation	Y or N
1. Sample labels present on bottles:	[Y]
2. Container labeling complete:	[Y]
3. Sample container label / COC agree:	[Y]

Sample Integrity - Condition	Y or N
1. Sample recvd within HT:	[Y]
2. All containers accounted for:	[Y]
3. Condition of sample:	Intact

Sample Integrity - Instructions	Y or N	N/A
1. Analysis requested is clear:	[Y]	
2. Bottles received for unspecified tests	[N]	
3. Sufficient volume recvd for analysis:	[Y]	
4. Compositing instructions clear:	[ ]	[Y]
5. Filtering instructions clear:	[ ]	[Y]

Comments

Accutest Laboratories
V:508.481.6200
495 Technology Center West, Bldg One
F: 508.481.7753
Marlborough, MA
www.accutest.com

MC32628: Chain of Custody
Page 2 of 2

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC32628

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC32628-2 Collected: 05-AUG-14 16:45 By: EA			Received: 06-AUG-14 By: SAP			
SVE42-080514(32-34')						
MC32628-2	SM21 2540 B MOD.	07-AUG-14	HS			%SOL
MC32628-2	SW846 8270D	07-AUG-14 16:09	WK	06-AUG-14	MT	AB8270SL+
MC32628-2	SW846 8015	07-AUG-14 19:00	AF			V8015GRO
MC32628-2	SW846 8011	11-AUG-14 23:15	SZ	11-AUG-14	AZ	V8011SL
MC32628-2	SW846 8270D BY SIM	13-AUG-14 10:24	MR	06-AUG-14	MT	B8270SIMSL
MC32628-2	SW846 8260C	15-AUG-14 20:04	JM			V8260SL+
MC32628-3 Collected: 05-AUG-14 00:00 By: EA			Received: 06-AUG-14 By: SAP			
TB-080514-HCL						
MC32628-3	SW846 8260C	18-AUG-14 11:16	GK			V8260SL+
MC32628-4 Collected: 05-AUG-14 00:00 By: EA			Received: 06-AUG-14 By: SAP			
TB-080514-ST						
MC32628-4	SW846 8011	19-AUG-14 18:13	AP	14-AUG-14	MT	V8011SL

Accutest Internal Chain of Custody

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/06/14

Sample,Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32628-1.5	Walk In Ref #5	Aysia Wood	08/06/14 17:54	Retrieve from Storage
MC32628-1.5	Aysia Wood	Walk In Ref #5	08/06/14 22:24	Return to Storage
MC32628-2.1	Walk In Ref #5	Hamid Siamak	08/07/14 11:27	Retrieve from Storage
MC32628-2.1	Hamid Siamak	Walk In Ref #5	08/07/14 14:06	Return to Storage
MC32628-2.1	Walk In Ref #5	Alireza Zeighami	08/11/14 07:36	Retrieve from Storage
MC32628-2.1	Alireza Zeighami	Walk In Ref #5	08/11/14 08:12	Return to Storage
MC32628-2.4	VOC Ref #10	Anthony Franciosa	08/07/14 07:53	Retrieve from Storage
MC32628-2.4	Anthony Franciosa	GCAB	08/07/14 07:53	Load on Instrument
MC32628-2.4	GCAB	Anthony Franciosa	08/08/14 09:08	Unload from Instrument
MC32628-2.4	Anthony Franciosa	VOC Ref #10	08/08/14 09:08	Return to Storage
MC32628-2.5	VOC Ref #10	Krysten Dufort	08/08/14 16:22	Retrieve from Storage
MC32628-2.5	Krysten Dufort	VOC Ref #10	08/11/14 10:30	Return to Storage
MC32628-2.5	VOC Ref #10	Jaime Maslowski	08/15/14 09:35	Retrieve from Storage
MC32628-2.5	Jaime Maslowski	VOC Ref #10	08/18/14 09:53	Return to Storage
MC32628-3.2	VOC Ref #2	Gary Krasinski	08/18/14 10:41	Retrieve from Storage
MC32628-3.2	Gary Krasinski	GCMSU	08/18/14 10:41	Load on Instrument
MC32628-3.2	GCMSU	Gary Krasinski	08/19/14 08:49	Unload from Instrument
MC32628-3.2	Gary Krasinski	VOC Ref #2	08/19/14 08:49	Return to Storage
MC32628-4.1	VOC Ref #1	Marc Tahtamoni	08/14/14 20:19	Retrieve from Storage

5.3

New England ACCUTEST LABORATORIES

GC/MS Volatiles

6

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	500	140	ug/kg	
107-02-8	Acrolein	ND	1300	440	ug/kg	
107-13-1	Acrylonitrile	ND	1300	140	ug/kg	
71-43-2	Benzene	ND	25	17	ug/kg	
108-86-1	Bromobenzene	ND	250	13	ug/kg	
74-97-5	Bromochloromethane	ND	250	17	ug/kg	
75-27-4	Bromodichloromethane	ND	100	10	ug/kg	
75-25-2	Bromoform	ND	100	18	ug/kg	
74-83-9	Bromomethane	ND	100	30	ug/kg	
78-93-3	2-Butanone (MEK)	ND	500	150	ug/kg	
104-51-8	n-Butylbenzene	ND	250	12	ug/kg	
135-98-8	sec-Butylbenzene	ND	250	37	ug/kg	
98-06-6	tert-Butylbenzene	ND	250	11	ug/kg	
75-15-0	Carbon disulfide	ND	250	6.5	ug/kg	
56-23-5	Carbon tetrachloride	ND	100	11	ug/kg	
108-90-7	Chlorobenzene	ND	100	7.9	ug/kg	
75-00-3	Chloroethane	ND	250	38	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	250	63	ug/kg	
67-66-3	Chloroform	ND	100	8.5	ug/kg	
74-87-3	Chloromethane	ND	250	28	ug/kg	
95-49-8	o-Chlorotoluene	ND	250	9.6	ug/kg	
106-43-4	p-Chlorotoluene	ND	250	13	ug/kg	
124-48-1	Dibromochloromethane	ND	100	16	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	100	11	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	100	15	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	100	17	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	100	40	ug/kg	
75-34-3	1,1-Dichloroethane	ND	100	13	ug/kg	
107-06-2	1,2-Dichloroethane	ND	100	16	ug/kg	
75-35-4	1,1-Dichloroethene	ND	100	21	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	100	23	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	100	21	ug/kg	
78-87-5	1,2-Dichloropropane	ND	100	21	ug/kg	
142-28-9	1,3-Dichloropropane	ND	250	16	ug/kg	
594-20-7	2,2-Dichloropropane	ND	250	28	ug/kg	
563-58-6	1,1-Dichloropropene	ND	250	13	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	100	11	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	100	13	ug/kg	
123-91-1	1,4-Dioxane	ND	1300	1000	ug/kg	
97-63-2	Ethyl methacrylate	ND	250	18	ug/kg	
100-41-4	Ethylbenzene	ND	100	34	ug/kg	
87-68-3	Hexachlorobutadiene	ND	250	29	ug/kg	
591-78-6	2-Hexanone	ND	500	38	ug/kg	
98-82-8	Isopropylbenzene	ND	250	8.4	ug/kg	
99-87-6	p-Isopropyltoluene	ND	250	8.7	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	100	9.1	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	250	27	ug/kg	
74-95-3	Methylene bromide	ND	250	23	ug/kg	
75-09-2	Methylene chloride	ND	100	27	ug/kg	
91-20-3	Naphthalene	ND	250	20	ug/kg	
103-65-1	n-Propylbenzene	ND	250	7.6	ug/kg	
100-42-5	Styrene	ND	250	8.5	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	250	20	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	100	20	ug/kg	
127-18-4	Tetrachloroethene	ND	100	16	ug/kg	
108-88-3	Toluene	ND	250	10	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	250	21	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	250	26	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	100	11	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	100	29	ug/kg	
79-01-6	Trichloroethene	ND	100	12	ug/kg	
75-69-4	Trichlorofluoromethane	ND	100	20	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	250	14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	250	72	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	250	76	ug/kg	
108-05-4	Vinyl Acetate	ND	250	77	ug/kg	
75-01-4	Vinyl chloride	ND	100	45	ug/kg	
	m,p-Xylene	ND	100	22	ug/kg	
95-47-6	o-Xylene	ND	100	14	ug/kg	
1330-20-7	Xylene (total)	ND	100	11	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-MB	K81113.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	107%	70-130%
2037-26-5	Toluene-D8	105%	70-130%
460-00-4	4-Bromofluorobenzene	105%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-MB	U21854.D	1	08/18/14	GK	n/a	n/a	MSU968

6.1.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-MB	U21854.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-MB	U21854.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	109%	70-130%
2037-26-5	Toluene-D8	111%	70-130%
460-00-4	4-Bromofluorobenzene	116%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

6.1.2

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
67-64-1	Acetone	2500	2960	118	70-130
107-02-8	Acrolein	12500	12700	102	70-130
107-13-1	Acrylonitrile	2500	2390	96	70-130
71-43-2	Benzene	2500	2450	98	70-130
108-86-1	Bromobenzene	2500	2630	105	70-130
74-97-5	Bromochloromethane	2500	2430	97	70-130
75-27-4	Bromodichloromethane	2500	2640	106	70-130
75-25-2	Bromoform	2500	2410	96	70-130
74-83-9	Bromomethane	2500	2470	99	70-130
78-93-3	2-Butanone (MEK)	2500	2660	106	70-130
104-51-8	n-Butylbenzene	2500	2840	114	70-130
135-98-8	sec-Butylbenzene	2500	2890	116	70-130
98-06-6	tert-Butylbenzene	2500	2900	116	70-130
75-15-0	Carbon disulfide	2500	2770	111	70-130
56-23-5	Carbon tetrachloride	2500	2770	111	70-130
108-90-7	Chlorobenzene	2500	2530	101	70-130
75-00-3	Chloroethane	2500	2950	118	70-130
110-75-8	2-Chloroethyl vinyl ether	2500	2510	100	10-160
67-66-3	Chloroform	2500	2380	95	70-130
74-87-3	Chloromethane	2500	2550	102	70-130
95-49-8	o-Chlorotoluene	2500	2580	103	70-130
106-43-4	p-Chlorotoluene	2500	2580	103	70-130
124-48-1	Dibromochloromethane	2500	2480	99	70-130
95-50-1	1,2-Dichlorobenzene	2500	2610	104	70-130
541-73-1	1,3-Dichlorobenzene	2500	2520	101	70-130
106-46-7	1,4-Dichlorobenzene	2500	2580	103	70-130
75-71-8	Dichlorodifluoromethane	2500	2940	118	70-130
75-34-3	1,1-Dichloroethane	2500	2640	106	70-130
107-06-2	1,2-Dichloroethane	2500	2410	96	70-130
75-35-4	1,1-Dichloroethene	2500	2920	117	70-130
156-59-2	cis-1,2-Dichloroethene	2500	2420	97	70-130
156-60-5	trans-1,2-Dichloroethene	2500	2580	103	70-130
78-87-5	1,2-Dichloropropane	2500	2650	106	70-130
142-28-9	1,3-Dichloropropane	2500	2490	100	70-130
594-20-7	2,2-Dichloropropane	2500	2580	103	70-130
563-58-6	1,1-Dichloropropene	2500	2710	108	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	2500	2570	103	70-130
10061-02-6	trans-1,3-Dichloropropene	2500	2700	108	70-130
123-91-1	1,4-Dioxane	6250	5270	84	70-130
97-63-2	Ethyl methacrylate	2500	2530	101	76-141
100-41-4	Ethylbenzene	2500	2560	102	70-130
87-68-3	Hexachlorobutadiene	2500	2730	109	70-130
591-78-6	2-Hexanone	2500	2410	96	70-130
98-82-8	Isopropylbenzene	2500	2920	117	70-130
99-87-6	p-Isopropyltoluene	2500	2770	111	70-130
1634-04-4	Methyl Tert Butyl Ether	2500	2430	97	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	2500	2300	92	70-130
74-95-3	Methylene bromide	2500	2480	99	70-130
75-09-2	Methylene chloride	2500	2630	105	70-130
91-20-3	Naphthalene	2500	2510	100	70-130
103-65-1	n-Propylbenzene	2500	2810	112	70-130
100-42-5	Styrene	2500	2510	100	70-130
630-20-6	1,1,1,2-Tetrachloroethane	2500	2520	101	70-130
79-34-5	1,1,2,2-Tetrachloroethane	2500	2540	102	70-130
127-18-4	Tetrachloroethene	2500	2620	105	70-130
108-88-3	Toluene	2500	2550	102	70-130
87-61-6	1,2,3-Trichlorobenzene	2500	2510	100	70-130
120-82-1	1,2,4-Trichlorobenzene	2500	2610	104	70-130
71-55-6	1,1,1-Trichloroethane	2500	2530	101	70-130
79-00-5	1,1,2-Trichloroethane	2500	2470	99	70-130
79-01-6	Trichloroethene	2500	2470	99	70-130
75-69-4	Trichlorofluoromethane	2500	2790	112	70-130
96-18-4	1,2,3-Trichloropropane	2500	2460	98	70-130
95-63-6	1,2,4-Trimethylbenzene	2500	2690	108	70-130
108-67-8	1,3,5-Trimethylbenzene	2500	2670	107	70-130
108-05-4	Vinyl Acetate	2500	1750	70	70-130
75-01-4	Vinyl chloride	2500	2600	104	70-130
	m,p-Xylene	5000	4980	100	70-130
95-47-6	o-Xylene	2500	2410	96	70-130
1330-20-7	Xylene (total)	7500	7390	99	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2566-BS	K81111.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	103%	70-130%
2037-26-5	Toluene-D8	109%	70-130%
460-00-4	4-Bromofluorobenzene	104%	70-130%

* = Outside of Control Limits.

6.2.1 (3)

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-BS	U21851.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
67-64-1	Acetone	50	41.0	82	70-130
107-02-8	Acrolein	250	183	73	70-130
107-13-1	Acrylonitrile	50	42.8	86	70-130
71-43-2	Benzene	50	47.1	94	70-130
108-86-1	Bromobenzene	50	46.5	93	70-130
74-97-5	Bromochloromethane	50	45.8	92	70-130
75-27-4	Bromodichloromethane	50	46.1	92	70-130
75-25-2	Bromoform	50	42.4	85	70-130
74-83-9	Bromomethane	50	42.6	85	70-130
78-93-3	2-Butanone (MEK)	50	44.4	89	70-130
104-51-8	n-Butylbenzene	50	52.5	105	70-130
135-98-8	sec-Butylbenzene	50	53.7	107	70-130
98-06-6	tert-Butylbenzene	50	44.5	89	70-130
75-15-0	Carbon disulfide	50	48.7	97	70-130
56-23-5	Carbon tetrachloride	50	36.8	74	70-130
108-90-7	Chlorobenzene	50	46.2	92	70-130
75-00-3	Chloroethane	50	51.0	102	70-130
110-75-8	2-Chloroethyl vinyl ether	50	41.5	83	70-130
67-66-3	Chloroform	50	46.0	92	70-130
74-87-3	Chloromethane	50	40.1	80	70-130
95-49-8	o-Chlorotoluene	50	49.8	100	70-130
106-43-4	p-Chlorotoluene	50	47.0	94	70-130
124-48-1	Dibromochloromethane	50	44.1	88	70-130
95-50-1	1,2-Dichlorobenzene	50	49.7	99	70-130
541-73-1	1,3-Dichlorobenzene	50	48.9	98	70-130
106-46-7	1,4-Dichlorobenzene	50	50.9	102	70-130
75-71-8	Dichlorodifluoromethane	50	32.8	66* a	70-130
75-34-3	1,1-Dichloroethane	50	46.8	94	70-130
107-06-2	1,2-Dichloroethane	50	40.3	81	70-130
75-35-4	1,1-Dichloroethene	50	45.0	90	70-130
156-59-2	cis-1,2-Dichloroethene	50	45.4	91	70-130
156-60-5	trans-1,2-Dichloroethene	50	43.8	88	70-130
78-87-5	1,2-Dichloropropane	50	46.5	93	70-130
142-28-9	1,3-Dichloropropane	50	49.2	98	70-130
594-20-7	2,2-Dichloropropane	50	46.9	94	70-130
563-58-6	1,1-Dichloropropene	50	42.5	85	70-130

* = Outside of Control Limits.

6.2.2

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-BS	U21851.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	50	46.9	94	70-130
10061-02-6	trans-1,3-Dichloropropene	50	46.5	93	70-130
123-91-1	1,4-Dioxane	125	125	100	70-130
97-63-2	Ethyl methacrylate	50	44.2	88	77-137
100-41-4	Ethylbenzene	50	46.7	93	70-130
87-68-3	Hexachlorobutadiene	50	44.9	90	70-130
591-78-6	2-Hexanone	50	39.4	79	70-130
98-82-8	Isopropylbenzene	50	53.9	108	70-130
99-87-6	p-Isopropyltoluene	50	51.9	104	70-130
1634-04-4	Methyl Tert Butyl Ether	50	45.3	91	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	50	41.8	84	70-130
74-95-3	Methylene bromide	50	44.0	88	70-130
75-09-2	Methylene chloride	50	46.8	94	70-130
91-20-3	Naphthalene	50	49.1	98	70-130
103-65-1	n-Propylbenzene	50	53.1	106	70-130
100-42-5	Styrene	50	45.6	91	70-130
630-20-6	1,1,1,2-Tetrachloroethane	50	42.8	86	70-130
79-34-5	1,1,2,2-Tetrachloroethane	50	54.3	109	70-130
127-18-4	Tetrachloroethene	50	45.6	91	70-130
108-88-3	Toluene	50	45.8	92	70-130
87-61-6	1,2,3-Trichlorobenzene	50	45.9	92	70-130
120-82-1	1,2,4-Trichlorobenzene	50	46.2	92	70-130
71-55-6	1,1,1-Trichloroethane	50	40.7	81	70-130
79-00-5	1,1,2-Trichloroethane	50	44.6	89	70-130
79-01-6	Trichloroethene	50	43.0	86	70-130
75-69-4	Trichlorofluoromethane	50	31.3	63* a	70-130
96-18-4	1,2,3-Trichloropropane	50	50.5	101	70-130
95-63-6	1,2,4-Trimethylbenzene	50	52.0	104	70-130
108-67-8	1,3,5-Trimethylbenzene	50	50.4	101	70-130
108-05-4	Vinyl Acetate	50	39.0	78	70-130
75-01-4	Vinyl chloride	50	40.9	82	70-130
	m,p-Xylene	100	93.6	94	70-130
95-47-6	o-Xylene	50	46.6	93	70-130
1330-20-7	Xylene (total)	150	140	93	70-130

* = Outside of Control Limits.

6.2.2

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSU968-BS	U21851.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	111%	70-130%
2037-26-5	Toluene-D8	109%	70-130%
460-00-4	4-Bromofluorobenzene	110%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

6.2.2

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	MC32860-8 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		3570	3720	104	3570	5160	144* [a]	32* [b]	70-130/30
107-02-8	Acrolein	ND		17900	18000	101	17900	17500	98	3	70-130/30
107-13-1	Acrylonitrile	ND		3570	3210	90	3570	3190	89	1	70-130/30
71-43-2	Benzene	ND		3570	3270	92	3570	3100	87	5	70-130/30
108-86-1	Bromobenzene	ND		3570	3640	102	3570	3490	98	4	70-130/30
74-97-5	Bromochloromethane	ND		3570	3290	92	3570	3230	90	2	70-130/30
75-27-4	Bromodichloromethane	ND		3570	3570	100	3570	3380	95	5	70-130/30
75-25-2	Bromoform	ND		3570	3250	91	3570	3150	88	3	70-130/30
74-83-9	Bromomethane	ND		3570	3520	98	3570	3360	94	5	70-130/30
78-93-3	2-Butanone (MEK)	ND		3570	3310	93	3570	3890	109	16	70-130/30
104-51-8	n-Butylbenzene	ND		3570	4060	114	3570	3880	109	5	70-130/30
135-98-8	sec-Butylbenzene	ND		3570	4190	117	3570	3910	109	7	70-130/30
98-06-6	tert-Butylbenzene	ND		3570	4090	114	3570	3910	109	5	70-130/30
75-15-0	Carbon disulfide	ND		3570	3680	103	3570	3490	98	5	70-130/30
56-23-5	Carbon tetrachloride	ND		3570	3850	108	3570	3560	100	8	70-130/30
108-90-7	Chlorobenzene	ND		3570	3430	96	3570	3270	92	5	70-130/30
75-00-3	Chloroethane	ND		3570	4150	116	3570	3920	110	6	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		3570	3580	100	3570	3360	94	6	10-160/30
67-66-3	Chloroform	ND		3570	3180	89	3570	3090	86	3	70-130/30
74-87-3	Chloromethane	ND		3570	3620	101	3570	3350	94	8	70-130/30
95-49-8	o-Chlorotoluene	ND		3570	3730	104	3570	3490	98	7	70-130/30
106-43-4	p-Chlorotoluene	ND		3570	3560	100	3570	3370	94	5	70-130/30
124-48-1	Dibromochloromethane	ND		3570	3310	93	3570	3220	90	3	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		3570	3570	100	3570	3380	95	5	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		3570	3580	100	3570	3370	94	6	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		3570	3560	100	3570	3450	97	3	70-130/30
75-71-8	Dichlorodifluoromethane	ND		3570	4120	115	3570	3920	110	5	70-130/30
75-34-3	1,1-Dichloroethane	ND		3570	3410	95	3570	3370	94	1	70-130/30
107-06-2	1,2-Dichloroethane	ND		3570	3270	92	3570	3110	87	5	70-130/30
75-35-4	1,1-Dichloroethene	ND		3570	3780	106	3570	3820	107	1	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		3570	3290	92	3570	3110	87	6	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		3570	3400	95	3570	3280	92	4	70-130/30
78-87-5	1,2-Dichloropropane	ND		3570	3570	100	3570	3290	92	8	70-130/30
142-28-9	1,3-Dichloropropane	ND		3570	3420	96	3570	3350	94	2	70-130/30
594-20-7	2,2-Dichloropropane	ND		3570	3500	98	3570	3350	94	4	70-130/30
563-58-6	1,1-Dichloropropene	ND		3570	3660	102	3570	3480	97	5	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Compound	MC32860-8 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		3570	3490	98	3570	3290	92	6	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		3570	3730	104	3570	3340	93	11	70-130/30
123-91-1	1,4-Dioxane	ND		8930	24800	278* [a]	8930	24000	269* [a]	3	70-130/30
97-63-2	Ethyl methacrylate	ND		3570	3620	101	3570	3320	93	9	41-160/30
100-41-4	Ethylbenzene	ND		3570	3500	98	3570	3270	92	7	70-130/30
87-68-3	Hexachlorobutadiene	ND		3570	4420	124	3570	4330	121	2	70-130/30
591-78-6	2-Hexanone	ND		3570	3510	98	3570	3490	98	1	70-130/30
98-82-8	Isopropylbenzene	ND		3570	4130	116	3570	3920	110	5	70-130/30
99-87-6	p-Isopropyltoluene	ND		3570	3990	112	3570	3790	106	5	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		3570	3280	92	3570	3240	91	1	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		3570	3350	94	3570	3130	88	7	70-130/30
74-95-3	Methylene bromide	ND		3570	3510	98	3570	3220	90	9	70-130/30
75-09-2	Methylene chloride	ND		3570	3450	97	3570	3440	96	0	70-130/30
91-20-3	Naphthalene	ND		3570	3550	99	3570	3300	92	7	70-130/30
103-65-1	n-Propylbenzene	ND		3570	3960	111	3570	3790	106	4	70-130/30
100-42-5	Styrene	ND		3570	3360	94	3570	3200	90	5	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		3570	3300	92	3570	3210	90	3	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		3570	3670	103	3570	3560	100	3	70-130/30
127-18-4	Tetrachloroethene	ND		3570	3450	97	3570	3360	94	3	70-130/30
108-88-3	Toluene	ND		3570	3480	97	3570	3190	89	9	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		3570	3450	97	3570	3290	92	5	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		3570	3620	101	3570	3440	96	5	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		3570	3460	97	3570	3330	93	4	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		3570	3480	97	3570	3150	88	10	70-130/30
79-01-6	Trichloroethene	ND		3570	3380	95	3570	3270	92	3	70-130/30
75-69-4	Trichlorofluoromethane	ND		3570	3880	109	3570	3740	105	4	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		3570	3570	100	3570	3320	93	7	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		3570	3910	109	3570	3740	105	4	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		3570	3750	105	3570	3570	100	5	70-130/30
108-05-4	Vinyl Acetate	ND		3570	2340	65* [a]	3570	2410	67* [a]	3	70-130/30
75-01-4	Vinyl chloride	ND		3570	3550	99	3570	3360	94	5	70-130/30
	m,p-Xylene	ND		7150	6850	96	7150	6590	92	4	70-130/30
95-47-6	o-Xylene	ND		3570	3320	93	3570	3230	90	3	70-130/30
1330-20-7	Xylene (total)	ND		10700	10200	95	10700	9820	92	4	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32860-8MS	K81118.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8MSD	K81119.D	1	08/15/14	JM	n/a	n/a	MSK2566
MC32860-8	K81115.D	1	08/15/14	JM	n/a	n/a	MSK2566

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-2

CAS No.	Surrogate Recoveries	MS	MSD	MC32860-8	Limits
1868-53-7	Dibromofluoromethane	105%	105%	105%	70-130%
2037-26-5	Toluene-D8	111%	105%	99%	70-130%
460-00-4	4-Bromofluorobenzene	111%	107%	104%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(b) High RPD due to possible matrix interference and/or sample non-homogeneity.

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33042-1MS	U21865.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1MSD	U21866.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1	U21860.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	MC33042-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		250	104	42* [a]	250	126	50* [a]	19	70-130/30
107-02-8	Acrolein	ND		1250	1200	96	1250	1120	90	7	70-130/30
107-13-1	Acrylonitrile	ND		250	277	111	250	270	108	3	70-130/30
71-43-2	Benzene	ND		250	285	114	250	275	110	4	70-130/30
108-86-1	Bromobenzene	ND		250	249	100	250	248	99	0	70-130/30
74-97-5	Bromochloromethane	ND		250	274	110	250	261	104	5	70-130/30
75-27-4	Bromodichloromethane	ND		250	265	106	250	259	104	2	70-130/30
75-25-2	Bromoform	ND		250	217	87	250	228	91	5	70-130/30
74-83-9	Bromomethane	ND		250	335	134* [a]	250	306	122	9	70-130/30
78-93-3	2-Butanone (MEK)	ND		250	206	82	250	215	86	4	70-130/30
104-51-8	n-Butylbenzene	ND		250	280	112	250	284	114	1	70-130/30
135-98-8	sec-Butylbenzene	ND		250	292	117	250	296	118	1	70-130/30
98-06-6	tert-Butylbenzene	ND		250	235	94	250	243	97	3	70-130/30
75-15-0	Carbon disulfide	ND		250	292	117	250	271	108	7	70-130/30
56-23-5	Carbon tetrachloride	ND		250	235	94	250	222	89	6	70-130/30
108-90-7	Chlorobenzene	ND		250	261	104	250	270	108	3	70-130/30
75-00-3	Chloroethane	ND		250	371	148* [a]	250	335	134* [a]	10	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		250	25.8	10* [a]	250	24.9	10* [a]	4	70-130/30
67-66-3	Chloroform	ND		250	292	117	250	273	109	7	70-130/30
74-87-3	Chloromethane	ND		250	322	129	250	301	120	7	70-130/30
95-49-8	o-Chlorotoluene	ND		250	261	104	250	262	105	0	70-130/30
106-43-4	p-Chlorotoluene	ND		250	252	101	250	249	100	1	70-130/30
124-48-1	Dibromochloromethane	ND		250	229	92	250	247	99	8	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		250	257	103	250	260	104	1	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		250	262	105	250	259	104	1	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		250	281	112	250	282	113	0	70-130/30
75-71-8	Dichlorodifluoromethane	ND		250	280	112	250	260	104	7	70-130/30
75-34-3	1,1-Dichloroethane	ND		250	305	122	250	281	112	8	70-130/30
107-06-2	1,2-Dichloroethane	ND		250	239	96	250	233	93	3	70-130/30
75-35-4	1,1-Dichloroethene	ND		250	309	124	250	281	112	9	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		250	287	115	250	263	105	9	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		250	285	114	250	263	105	8	70-130/30
78-87-5	1,2-Dichloropropane	ND		250	278	111	250	269	108	3	70-130/30
142-28-9	1,3-Dichloropropane	ND		250	279	112	250	288	115	3	70-130/30
594-20-7	2,2-Dichloropropane	ND		250	302	121	250	278	111	8	70-130/30
563-58-6	1,1-Dichloropropene	ND		250	263	105	250	253	101	4	70-130/30

* = Outside of Control Limits.

6.3.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33042-1MS	U21865.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1MSD	U21866.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1	U21860.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Compound	MC33042-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		250	278	111	250	262	105	6	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		250	292	117	250	250	100	15	70-130/30
123-91-1	1,4-Dioxane	ND		625	529	85	625	536	86	1	70-130/30
97-63-2	Ethyl methacrylate	ND		250	285	114	250	246	98	15	72-139/30
100-41-4	Ethylbenzene	ND		250	266	106	250	281	112	5	70-130/30
87-68-3	Hexachlorobutadiene	ND		250	209	84	250	215	86	3	70-130/30
591-78-6	2-Hexanone	ND		250	161	64* [a]	250	157	63* [a]	3	70-130/30
98-82-8	Isopropylbenzene	ND		250	288	115	250	293	117	2	70-130/30
99-87-6	p-Isopropyltoluene	ND		250	285	114	250	288	115	1	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		250	269	108	250	261	104	3	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		250	248	99	250	223	89	11	70-130/30
74-95-3	Methylene bromide	ND		250	264	106	250	252	101	5	70-130/30
75-09-2	Methylene chloride	ND		250	302	121	250	274	110	10	70-130/30
91-20-3	Naphthalene	ND		250	224	90	250	246	98	9	70-130/30
103-65-1	n-Propylbenzene	ND		250	288	115	250	287	115	0	70-130/30
100-42-5	Styrene	ND		250	256	102	250	263	105	3	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		250	222	89	250	245	98	10	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		250	296	118	250	300	120	1	70-130/30
127-18-4	Tetrachloroethene	ND		250	249	100	250	270	108	8	70-130/30
108-88-3	Toluene	ND		250	292	117	250	270	108	8	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		250	187	75	250	222	89	17	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		250	193	77	250	221	88	14	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		250	271	108	250	251	100	8	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		250	286	114	250	255	102	11	70-130/30
79-01-6	Trichloroethene	ND		250	252	101	250	247	99	2	70-130/30
75-69-4	Trichlorofluoromethane	ND		250	234	94	250	218	87	7	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		250	253	101	250	257	103	2	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		250	278	111	250	283	113	2	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		250	270	108	250	275	110	2	70-130/30
108-05-4	Vinyl Acetate	ND		250	231	92	250	225	90	3	70-130/30
75-01-4	Vinyl chloride	ND		250	349	140* [a]	250	332	133* [a]	5	70-130/30
	m,p-Xylene	ND		500	538	108	500	563	113	5	70-130/30
95-47-6	o-Xylene	ND		250	263	105	250	280	112	6	70-130/30
1330-20-7	Xylene (total)	ND		750	801	107	750	843	112	5	70-130/30

* = Outside of Control Limits.

6.3.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL; Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33042-1MS	U21865.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1MSD	U21866.D	5	08/18/14	GK	n/a	n/a	MSU968
MC33042-1	U21860.D	1	08/18/14	GK	n/a	n/a	MSU968

The QC reported here applies to the following samples: Method: SW846 8260C

MC32628-3

CAS No.	Surrogate Recoveries	MS	MSD	MC33042-1	Limits
1868-53-7	Dibromofluoromethane	123%	118%	120%	70-130%
2037-26-5	Toluene-D8	118%	111%	106%	70-130%
460-00-4	4-Bromofluorobenzene	104%	102%	107%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

6.3.2

Volatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSK2566-CC2552	Injection Date:	08/15/14
Lab File ID:	K81110.D	Injection Time:	08:58
Instrument ID:	GCMSK	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	109976	8.78	143475	9.63	60320	12.89	79859	15.45	55188	6.42
Upper Limit [a]	219952	9.28	286950	10.13	120640	13.39	159718	15.95	110376	6.92
Lower Limit [b]	54988	8.28	71738	9.13	30160	12.39	39930	14.95	27594	5.92
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSK2566-BS	116909	8.78	148139	9.63	62180	12.89	84173	15.45	59660	6.42
MSK2566-MB	117081	8.78	153707	9.63	60071	12.89	91314	15.44	58770	6.43
ZZZZZZ	122256	8.78	151864	9.63	60366	12.89	88722	15.44	62841	6.43
MC32860-8	117065	8.78	148476	9.63	55784	12.89	83641	15.44	62164	6.42
ZZZZZZ	127258	8.78	163273	9.63	61930	12.89	91732	15.45	63931	6.43
ZZZZZZ	129569	8.79	165315	9.63	64395	12.89	94278	15.44	64494	6.42
MC32860-8MS	114017	8.78	145006	9.63	61896	12.89	79719	15.44	61045	6.42
MC32860-8MSD	118581	8.78	154847	9.63	63874	12.89	83498	15.45	61067	6.42
ZZZZZZ	117972	8.78	151316	9.63	56746	12.89	82278	15.44	62529	6.42
ZZZZZZ	115298	8.78	146423	9.63	54299	12.89	80763	15.44	61953	6.42
ZZZZZZ	116803	8.78	152723	9.63	59212	12.89	88307	15.44	65592	6.42
ZZZZZZ	123945	8.78	155163	9.63	58224	12.89	85749	15.44	64583	6.42
ZZZZZZ	118291	8.78	152693	9.63	61610	12.89	90955	15.44	59169	6.43
ZZZZZZ	120826	8.78	154744	9.63	58412	12.89	86284	15.44	66506	6.42
ZZZZZZ	120931	8.78	153691	9.63	61264	12.89	88003	15.44	66712	6.43
ZZZZZZ	120854	8.78	158272	9.63	59198	12.89	87540	15.44	63681	6.43
ZZZZZZ	122036	8.79	156355	9.63	61100	12.89	90748	15.44	64577	6.43
ZZZZZZ	123738	8.78	156796	9.63	60730	12.89	85557	15.44	64429	6.42
ZZZZZZ	124676	8.78	158360	9.63	62088	12.89	89001	15.44	60641	6.42
ZZZZZZ	118085	8.78	154869	9.63	61908	12.89	93264	15.44	62220	6.43
ZZZZZZ	114378	8.78	147237	9.63	55743	12.89	82812	15.44	61820	6.42
ZZZZZZ	110625	8.78	141381	9.63	55917	12.89	77681	15.44	60438	6.41
MC32628-2	111704	8.78	146447	9.63	54505	12.89	78046	15.44	62807	6.42
ZZZZZZ	123763	8.79	156916	9.63	62412	12.89	84570	15.44	63243	6.40

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

Volatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSU968-CC957	Injection Date:	08/18/14
Lab File ID:	U21850.D	Injection Time:	09:00
Instrument ID:	GCMSU	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	942852	8.97	1584049	9.84	553412	13.10	821086	15.66	359008	6.60
Upper Limit [a]	1885704	9.47	3168098	10.34	1106824	13.60	1642172	16.16	718016	7.10
Lower Limit [b]	471426	8.47	792025	9.34	276706	12.60	410543	15.16	179504	6.10
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSU968-BS	920375	8.97	1555595	9.84	533210	13.10	755727	15.66	363309	6.63
MSU968-MB	824652	8.98	1309215	9.85	444058	13.10	617048	15.67	337586	6.63
MC32628-3	724136	8.98	1144845	9.84	339045	13.10	535557	15.67	249502	6.62
ZZZZZZ	539182	8.98	882914	9.84	310632	13.10	435500	15.67	219847	6.61
MC33042-1	478022	8.98	771288[c]	9.84	249652[c]	13.10	396070[c]	15.67	202442	6.63
MC33042-1MS	427757[c]	8.97	759465[c]	9.84	296404	13.09	441980	15.66	185220	6.60
MC33042-1MSD	477893	8.97	840792	9.84	279732	13.10	434098	15.66	191152	6.60

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.
(c) Outside control limits due to possible matrix interference. Confirmed by MS/MSD.

6.4.2

Volatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32628-3	U21855.D	111	101	108
MC33042-1MS	U21865.D	123	118	104
MC33042-1MSD	U21866.D	118	111	102
MSU968-BS	U21851.D	111	109	110
MSU968-MB	U21854.D	109	111	116

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32628-2	K81134.D	104	102	115
MC32860-8MS	K81118.D	105	111	111
MC32860-8MSD	K81119.D	105	105	107
MSK2566-BS	K81111.D	103	109	104
MSK2566-MB	K81113.D	107	105	105

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.2

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-MB	F75200.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	480	60	ug/kg	
95-57-8	2-Chlorophenol	ND	240	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	480	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	480	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	480	78	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	960	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	480	60	ug/kg	
95-48-7	2-Methylphenol	ND	480	19	ug/kg	
	3&4-Methylphenol	ND	480	23	ug/kg	
88-75-5	2-Nitrophenol	ND	480	13	ug/kg	
100-02-7	4-Nitrophenol	ND	960	90	ug/kg	
87-86-5	Pentachlorophenol	ND	480	34	ug/kg	
108-95-2	Phenol	ND	240	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	480	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	480	12	ug/kg	
62-53-3	Aniline	ND	480	24	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	240	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	240	9.8	ug/kg	
100-51-6	Benzyl Alcohol	ND	480	24	ug/kg	
91-58-7	2-Chloronaphthalene	ND	240	13	ug/kg	
106-47-8	4-Chloroaniline	ND	480	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	240	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	240	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	240	17	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	240	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	240	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	480	32	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	480	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	240	24	ug/kg	
132-64-9	Dibenzofuran	ND	96	13	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	240	25	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	240	7.5	ug/kg	
84-66-2	Diethyl phthalate	ND	240	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	240	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	240	8.9	ug/kg	
118-74-1	Hexachlorobenzene	ND	240	15	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-MB	F75200.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	480	120	ug/kg	
67-72-1	Hexachloroethane	ND	240	12	ug/kg	
78-59-1	Isophorone	ND	240	11	ug/kg	
88-74-4	2-Nitroaniline	ND	480	12	ug/kg	
99-09-2	3-Nitroaniline	ND	480	26	ug/kg	
100-01-6	4-Nitroaniline	ND	480	12	ug/kg	
98-95-3	Nitrobenzene	ND	240	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	240	11	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	240	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	240	15	ug/kg	
110-86-1	Pyridine	ND	480	24	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	70%	30-130%
4165-62-2	Phenol-d5	64%	30-130%
118-79-6	2,4,6-Tribromophenol	74%	30-130%
4165-60-0	Nitrobenzene-d5	64%	30-130%
321-60-8	2-Fluorobiphenyl	76%	30-130%
1718-51-0	Terphenyl-d14	82%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39293-MB	I91193.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32628-2

7.1.2

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.8	0.83	ug/kg	
208-96-8	Acenaphthylene	ND	4.8	0.73	ug/kg	
120-12-7	Anthracene	ND	4.8	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.8	2.2	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.8	1.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.8	2.1	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.8	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.8	1.5	ug/kg	
218-01-9	Chrysene	ND	4.8	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.8	1.4	ug/kg	
206-44-0	Fluoranthene	ND	4.8	1.4	ug/kg	
86-73-7	Fluorene	ND	4.8	0.95	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.8	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	ND	9.6	1.0	ug/kg	
91-57-6	2-Methylnaphthalene	ND	9.6	0.89	ug/kg	
85-01-8	Phenanthrene	ND	4.8	1.0	ug/kg	
129-00-0	Pyrene	ND	4.8	1.5	ug/kg	

CAS No.	Surrogate Recoveries		Limits
4165-60-0	Nitrobenzene-d5	77%	30-130%
321-60-8	2-Fluorobiphenyl	74%	30-130%
1718-51-0	Terphenyl-d14	94%	30-130%

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39293-BS	I91194.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32628-2

7.2.1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2380	1810	76	40-140
208-96-8	Acenaphthylene	2380	1560	65	40-140
120-12-7	Anthracene	2380	1930	81	40-140
56-55-3	Benzo(a)anthracene	2380	2420	102	40-140
50-32-8	Benzo(a)pyrene	2380	2160	91	40-140
205-99-2	Benzo(b)fluoranthene	2380	2540	107	40-140
191-24-2	Benzo(g,h,i)perylene	2380	2270	95	40-140
207-08-9	Benzo(k)fluoranthene	2380	2170	91	40-140
218-01-9	Chrysene	2380	2000	84	40-140
53-70-3	Dibenzo(a,h)anthracene	2380	2440	102	40-140
206-44-0	Fluoranthene	2380	2190	92	40-140
86-73-7	Fluorene	2380	1860	78	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2380	2360	99	40-140
90-12-0	1-Methylnaphthalene	2380	1760	74	40-140
91-57-6	2-Methylnaphthalene	2380	1800	76	40-140
85-01-8	Phenanthrene	2380	1950	82	40-140
129-00-0	Pyrene	2380	2170	91	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
4165-60-0	Nitrobenzene-d5	78%	30-130%
321-60-8	2-Fluorobiphenyl	75%	30-130%
1718-51-0	Terphenyl-d14	98%	30-130%

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-BS	F75201.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
OP39292-BSD	X04257.D	1	08/08/14	WK	08/06/14	OP39292	MSX140

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	2380	2490	104	900	36	94* a	30-130/30
95-57-8	2-Chlorophenol	2380	1870	78	1790	72	4	30-130/30
59-50-7	4-Chloro-3-methyl phenol	2380	1690	71	1760	71	4	30-130/30
120-83-2	2,4-Dichlorophenol	2380	1710	72	1850	74	8	30-130/30
105-67-9	2,4-Dimethylphenol	2380	1730	73	1800	72	4	30-130/30
51-28-5	2,4-Dinitrophenol	2380	1100	46	936	38	16	30-130/30
534-52-1	4,6-Dinitro-o-cresol	2380	1500	63	1780	72	17	30-130/30
95-48-7	2-Methylphenol	2380	1870	78	1660	67	12	30-130/30
	3&4-Methylphenol	4770	3620	76	3480	70	4	30-130/30
88-75-5	2-Nitrophenol	2380	1810	76	1800	72	1	30-130/30
100-02-7	4-Nitrophenol	2380	1280	54	1460	59	13	30-130/30
87-86-5	Pentachlorophenol	2380	2050	86	1560	63	27	30-130/30
108-95-2	Phenol	2380	1810	76	1810	73	0	30-130/30
95-95-4	2,4,5-Trichlorophenol	2380	1870	78	1970	79	5	30-130/30
88-06-2	2,4,6-Trichlorophenol	2380	1710	72	1860	75	8	30-130/30
62-53-3	Aniline	2380	1540	65	1560	63	1	40-140/30
101-55-3	4-Bromophenyl phenyl ether	2380	1980	83	2140	86	8	40-140/30
85-68-7	Butyl benzyl phthalate	2380	2440	102	1910	77	24	40-140/30
100-51-6	Benzyl Alcohol	2380	1160	49	1270	51	9	40-140/30
91-58-7	2-Chloronaphthalene	2380	1870	78	1900	76	2	40-140/30
106-47-8	4-Chloroaniline	2380	1630	68	1710	69	5	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	2380	1660	70	1790	72	8	40-140/30
111-44-4	bis(2-Chloroethyl)ether	2380	2020	85	1700	68	17	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	2380	2860	120	1560	63	59* b	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	2380	1690	71	2010	81	17	40-140/30
122-66-7	1,2-Diphenylhydrazine	2380	1940	81	1970	79	2	40-140/30
121-14-2	2,4-Dinitrotoluene	2380	1910	80	2000	80	5	40-140/30
606-20-2	2,6-Dinitrotoluene	2380	1840	77	2050	82	11	40-140/30
91-94-1	3,3'-Dichlorobenzidine	2380	2360	99	2180	88	8	40-140/30
132-64-9	Dibenzofuran	2380	1730	73	1730	70	0	40-140/30
84-74-2	Di-n-butyl phthalate	2380	2340	98	1810	73	26	40-140/30
117-84-0	Di-n-octyl phthalate	2380	2500	105	1900	76	27	40-140/30
84-66-2	Diethyl phthalate	2380	1990	84	1920	77	4	40-140/30
131-11-3	Dimethyl phthalate	2380	2040	86	1930	78	6	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	2380	2610	110	2070	83	23	40-140/30
118-74-1	Hexachlorobenzene	2380	1930	81	2280	92	17	40-140/30

* = Outside of Control Limits.

7.3.1

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-BS	F75201.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
OP39292-BSD	X04257.D	1	08/08/14	WK	08/06/14	OP39292	MSX140

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	2380	689	29* a	1160	47	51* a	40-140/30
67-72-1	Hexachloroethane	2380	1670	70	1760	71	5	40-140/30
78-59-1	Isophorone	2380	1600	67	1650	66	3	40-140/30
88-74-4	2-Nitroaniline	2380	2040	86	1990	80	2	40-140/30
99-09-2	3-Nitroaniline	2380	1940	81	1830	74	6	40-140/30
100-01-6	4-Nitroaniline	2380	1880	79	1760	71	7	40-140/30
98-95-3	Nitrobenzene	2380	1540	65	1750	70	13	40-140/30
62-75-9	n-Nitrosodimethylamine	2380	1690	71	1480	60	13	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	2380	1740	73	1780	72	2	40-140/30
86-30-6	N-Nitrosodiphenylamine	2380	1920	81	1760	71	9	40-140/30
110-86-1	Pyridine	2380	1380	58	1280	51	8	40-140/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
367-12-4	2-Fluorophenol	78%	64%	30-130%
4165-62-2	Phenol-d5	72%	69%	30-130%
118-79-6	2,4,6-Tribromophenol	83%	92%	30-130%
4165-60-0	Nitrobenzene-d5	67%	72%	30-130%
321-60-8	2-Fluorobiphenyl	73%	75%	30-130%
1718-51-0	Terphenyl-d14	86%	80%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.
(b) Analyte recovery satisfactory.

* = Outside of Control Limits.

7.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-MS	F75203.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
OP39292-MSD	F75204.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
MC32628-2	F75205.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	MC32628-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		3000	697	23* [a]	2940	659	22* [a]	6	30-130/30
95-57-8	2-Chlorophenol	ND		3000	2250	75	2940	1940	66	15	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		3000	1830	61	2940	2180	74	17	30-130/30
120-83-2	2,4-Dichlorophenol	ND		3000	2070	69	2940	1840	63	12	30-130/30
105-67-9	2,4-Dimethylphenol	ND		3000	1630	54	2940	1630	55	0	30-130/30
51-28-5	2,4-Dinitrophenol	ND		3000	378	13* [b]	2940	371	13* [b]	2	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		3000	682	23* [b]	2940	725	25* [b]	6	30-130/30
95-48-7	2-Methylphenol	ND		3000	2290	76	2940	1800	61	24	30-130/30
	3&4-Methylphenol	ND		5990	4520	75	5880	3510	60	25	30-130/30
88-75-5	2-Nitrophenol	ND		3000	1780	59	2940	1860	63	4	30-130/30
100-02-7	4-Nitrophenol	ND		3000	1620	54	2940	1520	52	6	30-130/30
87-86-5	Pentachlorophenol	ND		3000	2160	72	2940	2260	77	5	30-130/30
108-95-2	Phenol	ND		3000	2240	75	2940	1760	60	24	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		3000	2330	78	2940	2180	74	7	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		3000	2150	72	2940	2160	73	0	30-130/30
62-53-3	Aniline	ND		3000	1840	61	2940	1560	53	16	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		3000	2260	75	2940	2200	75	3	40-140/30
85-68-7	Butyl benzyl phthalate	ND		3000	3040	101	2940	2970	101	2	40-140/30
100-51-6	Benzyl Alcohol	ND		3000	1290	43	2940	1190	40	8	40-140/30
91-58-7	2-Chloronaphthalene	ND		3000	2390	80	2940	2300	78	4	40-140/30
106-47-8	4-Chloroaniline	ND		3000	2010	67	2940	1800	61	11	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		3000	1720	57	2940	1790	61	4	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		3000	2420	81	2940	2120	72	13	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		3000	3740	125	2940	2770	94	30	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		3000	2040	68	2940	1960	67	4	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		3000	2410	80	2940	2210	75	9	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		3000	2230	74	2940	2160	73	3	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		3000	2050	68	2940	2020	69	1	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		3000	2600	87	2940	2680	91	3	40-140/30
132-64-9	Dibenzofuran	ND		3000	2180	73	2940	2100	71	4	40-140/30
84-74-2	Di-n-butyl phthalate	ND		3000	2520	84	2940	2910	99	14	40-140/30
117-84-0	Di-n-octyl phthalate	ND		3000	3000	100	2940	2920	99	3	40-140/30
84-66-2	Diethyl phthalate	ND		3000	2400	80	2940	2390	81	0	40-140/30
131-11-3	Dimethyl phthalate	ND		3000	2390	80	2940	2300	78	4	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		3000	2900	97	2940	2920	99	1	40-140/30
118-74-1	Hexachlorobenzene	ND		3000	2200	73	2940	2360	80	7	40-140/30

* = Outside of Control Limits.

7.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39292-MS	F75203.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
OP39292-MSD	F75204.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309
MC32628-2	F75205.D	1	08/07/14	WK	08/06/14	OP39292	MSF3309

The QC reported here applies to the following samples: Method: SW846 8270D

MC32628-2

CAS No.	Compound	MC32628-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		3000	770	26* [a]	2940	703	24* [a]	9	40-140/30
67-72-1	Hexachloroethane	ND		3000	2140	71	2940	1530	52	33* [c]	40-140/30
78-59-1	Isophorone	ND		3000	1660	55	2940	1650	56	1	40-140/30
88-74-4	2-Nitroaniline	ND		3000	2510	84	2940	2510	85	0	40-140/30
99-09-2	3-Nitroaniline	ND		3000	2210	74	2940	2140	73	3	40-140/30
100-01-6	4-Nitroaniline	ND		3000	2140	71	2940	2120	72	1	40-140/30
98-95-3	Nitrobenzene	ND		3000	1680	56	2940	1480	50	13	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		3000	1680	56	2940	1290	44	26	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		3000	2250	75	2940	1710	58	27	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		3000	2200	73	2940	2140	73	3	40-140/30
110-86-1	Pyridine	ND		3000	1470	49	2940	1100	37* [b]	29	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32628-2	Limits
367-12-4	2-Fluorophenol	74%	60%	56%	30-130%
4165-62-2	Phenol-d5	73%	64%	52%	30-130%
118-79-6	2,4,6-Tribromophenol	68%	71%	58%	30-130%
4165-60-0	Nitrobenzene-d5	57%	55%	52%	30-130%
321-60-8	2-Fluorobiphenyl	73%	72%	57%	30-130%
1718-51-0	Terphenyl-d14	79%	80%	70%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.
(b) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(c) High RPD due to possible matrix interference and/or sample heterogeneity.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39293-MS	I91195.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395
OP39293-MSD	I91196.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395
MC32628-2	I91197.D	1	08/13/14	MR	08/06/14	OP39293	MSI3395

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32628-2

7.4.2

7

CAS No.	Compound	MC32628-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	ND		3000	2200	73	2940	2030	69	8	40-140/30
208-96-8	Acenaphthylene	ND		3000	1910	64	2940	1760	60	8	40-140/30
120-12-7	Anthracene	ND		3000	2260	75	2940	2210	75	2	40-140/30
56-55-3	Benzo(a)anthracene	ND		3000	2770	92	2940	2810	96	1	40-140/30
50-32-8	Benzo(a)pyrene	ND		3000	2440	81	2940	2440	83	0	40-140/30
205-99-2	Benzo(b)fluoranthene	ND		3000	3110	104	2940	2990	102	4	40-140/30
191-24-2	Benzo(g,h,i)perylene	ND		3000	2560	85	2940	2540	86	1	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		3000	2300	77	2940	2360	80	3	40-140/30
218-01-9	Chrysene	ND		3000	2320	77	2940	2340	80	1	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		3000	2760	92	2940	2750	94	0	40-140/30
206-44-0	Fluoranthene	ND		3000	2590	86	2940	2560	87	1	40-140/30
86-73-7	Fluorene	ND		3000	2190	73	2940	2080	71	5	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		3000	2670	89	2940	2660	90	0	40-140/30
90-12-0	1-Methylnaphthalene	ND		3000	2160	72	2940	1920	65	12	40-140/30
91-57-6	2-Methylnaphthalene	1.3	J	3000	2230	74	2940	1950	66	13	40-140/30
85-01-8	Phenanthrene	ND		3000	2250	75	2940	2190	74	3	40-140/30
129-00-0	Pyrene	ND		3000	2540	85	2940	2520	86	1	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32628-2	Limits
4165-60-0	Nitrobenzene-d5	76%	68%	59%	30-130%
321-60-8	2-Fluorobiphenyl	73%	68%	57%	30-130%
1718-51-0	Terphenyl-d14	88%	92%	80%	30-130%

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3309-CC3270	Injection Date:	08/07/14
Lab File ID:	F75186.D	Injection Time:	08:45
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	193076	2.94	700755	3.97	416854	5.45	722473	6.68	764260	8.95	723158	10.33
Upper Limit [a]	386152	3.44	1401510	4.47	833708	5.95	1444946	7.18	1528520	9.45	1446316	10.83
Lower Limit [b]	96538	2.44	350378	3.47	208427	4.95	361237	6.18	382130	8.45	361579	9.83

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39161-MB	166849	2.94	609129	3.96	349833	5.44	583024	6.68	631801	8.94	543386	10.32
OP39161-BS	171585	2.94	606545	3.96	371491	5.44	616288	6.68	593747	8.95	576021	10.32
ZZZZZZ	162061	2.94	562301	3.96	332595	5.44	609183	6.68	589289	8.94	531636	10.32
ZZZZZZ	160733	2.94	585029	3.96	346910	5.45	567706	6.68	614233	8.94	550881	10.33
ZZZZZZ	166143	2.94	593078	3.96	341975	5.44	603454	6.68	595563	8.95	533154	10.32
ZZZZZZ	161644	2.94	604184	3.96	361850	5.44	579404	6.68	571597	8.94	542832	10.32
ZZZZZZ	178142	2.94	629450	3.96	391337	5.44	628812	6.68	642153	8.94	584827	10.32
ZZZZZZ	154544	2.94	564309	3.96	332056	5.44	578123	6.68	627100	8.94	604793	10.33
ZZZZZZ	154787	2.94	536452	3.96	335781	5.45	590682	6.68	614750	8.94	583040	10.33
ZZZZZZ	150456	2.94	584355	3.96	339535	5.44	570057	6.68	630215	8.94	609437	10.32
ZZZZZZ	171285	2.94	618093	3.96	369953	5.44	614190	6.68	631772	8.94	633436	10.32
ZZZZZZ	160085	2.94	556495	3.96	338545	5.44	564455	6.68	583484	8.94	631155	10.33
ZZZZZZ	162356	2.94	553914	3.96	351440	5.44	539451	6.68	647732	8.95	655628	10.33
OP39292-MB	164945	2.94	577376	3.96	332120	5.44	540731	6.68	540619	8.94	573527	10.33
OP39292-BS	204204	2.94	691538	3.96	432114	5.45	679509	6.68	751461	8.95	700709	10.33
ZZZZZZ	170185	2.94	632279	3.96	356879	5.45	661295	6.68	659419	8.94	649886	10.33
OP39292-MS	151099	2.94	589564	3.96	343464	5.45	575411	6.68	569636	8.95	529078	10.33
OP39292-MSD	173730	2.94	571244	3.96	330463	5.44	558271	6.68	646996	8.95	627436	10.33
MC32628-2	170698	2.94	572941	3.96	390409	5.44	661058	6.68	676569	8.94	665700	10.33
ZZZZZZ	137796	2.94	484381	3.96	294295	5.44	503962	6.68	548194	8.94	548727	10.32
OP39281-MB	133154	2.94	489891	3.96	343275	5.44	541168	6.68	607191	8.94	580841	10.32
OP39281-LB	133154	2.94	489891	3.96	343275	5.44	541168	6.68	607191	8.94	580841	10.32
OP39281-BS	141599	2.94	521014	3.96	321089	5.44	495585	6.68	605912	8.95	552940	10.33
OP39281-MS	148778	2.94	567950	3.96	331286	5.45	650073	6.68	708335	8.95	718989	10.33
OP39281-MSD	156493	2.94	521043	3.96	351943	5.45	545277	6.68	671975	8.95	674366	10.33
MC32562-11	153032	2.94	542488	3.96	344948	5.44	572638	6.68	639095	8.94	663527	10.33
ZZZZZZ	125762	2.94	456221	3.96	289282	5.44	495846	6.68	631951	8.94	575735	10.32
ZZZZZZ	160449	2.94	572098	3.96	345569	5.44	541910	6.68	554232	8.94	628502	10.32
ZZZZZZ	156464	2.94	547292	3.96	333728	5.44	530334	6.68	601313	8.95	618241	10.33

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12

7.5.1

Semivolatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3309-CC3270	Injection Date:	08/07/14
Lab File ID:	F75186.D	Injection Time:	08:45
Instrument ID:	GCMSF	Method:	SW846 8270D

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.1

Semivolatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3395-CC3386	Injection Date:	08/13/14
Lab File ID:	I91191.D	Injection Time:	08:05
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	447253	4.11	975761	5.16	513094	6.69	871613	8.08	610546	10.85	1551996	12.34
Upper Limit [a]	894506	4.61	1951522	5.66	1026188	7.19	1743226	8.58	1221092	11.35	3103992	12.84
Lower Limit [b]	223627	3.61	487881	4.66	256547	6.19	435807	7.58	305273	10.35	775998	11.84
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
MC32660-1	507137	4.10	1084237	5.16	568193	6.69	942660	8.08	626812	10.85	1617411	12.34
OP39293-MB	494701	4.11	1090832	5.16	566062	6.69	948781	8.08	631666	10.85	1585693	12.34
OP39293-BS	588769	4.11	1267065	5.16	653267	6.69	1080304	8.08	743701	10.86	1767654	12.35
OP39293-MS	503185	4.11	1085578	5.16	552507	6.69	911928	8.08	600305	10.85	1483414	12.34
OP39293-MSD	550135	4.11	1195700	5.16	607562	6.69	994336	8.08	654750	10.86	1626732	12.35
MC32628-2	555248	4.11	1220109	5.16	630036	6.69	1043936	8.08	680757	10.85	1735230	12.34
OP39356-MB	435653	4.11	963221	5.16	506097	6.69	849308	8.08	592632	10.85	1530979	12.34
OP39356-BS	458324	4.11	1009873	5.16	523460	6.69	872358	8.08	603586	10.85	1519524	12.34
OP39356-MS	454819	4.09	1001843	5.15	520945	6.69	863638	8.08	597521	10.85	1506939	12.34
OP39356-MSD	476030	4.11	1050582	5.16	542305	6.69	893006	8.08	615421	10.86	1542520	12.35
MC32762-3	427900	4.11	950806	5.16	501819	6.69	843346	8.08	577192	10.85	1494012	12.34
ZZZZZZ	432590	4.11	968953	5.16	505827	6.69	848352	8.08	586866	10.85	1515051	12.34
ZZZZZZ	430155	4.11	955854	5.16	500599	6.69	838315	8.08	577736	10.85	1493924	12.34

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.2

Semivolatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSX140-CC106	Injection Date:	08/08/14
Lab File ID:	X04256.D	Injection Time:	07:46
Instrument ID:	GCMSX	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	352329	3.27	1356787	4.31	748213	5.82	1182365	7.08	978655	9.45	832751	10.96
Upper Limit [a]	704658	3.77	2713574	4.81	1496426	6.32	2364730	7.58	1957310	9.95	1665502	11.46
Lower Limit [b]	176165	2.77	678394	3.81	374107	5.32	591183	6.58	489328	8.95	416376	10.46

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39292-BSD	574105[c]	3.27	2075461[c]	4.31	1101929[c]	5.82	1665732[c]	7.08	1296438[c]	9.45	1165334[c]	10.97
ZZZZZZ	294030	3.27	1045079	4.30	538637	5.81	767787	7.07	565819	9.44	518514	10.96
ZZZZZZ	259642	3.27	936435	4.30	493544	5.81	728403	7.07	614188	9.45	485246	10.97
ZZZZZZ	268912	3.27	964155	4.30	506623	5.81	744253	7.07	605863	9.45	485313	10.97
ZZZZZZ	256414	3.27	942138	4.31	482798	5.81	725784	7.08	625215	9.45	489397	10.97
ZZZZZZ	265843	3.27	935823	4.31	488459	5.81	713948	7.08	614397	9.46	484684	10.98
ZZZZZZ	284776	3.27	1030333	4.31	552313	5.81	821455	7.07	601300	9.44	547544	10.96
ZZZZZZ	301812	3.27	1081609	4.31	562736	5.81	805684	7.07	588589	9.44	534151	10.96
ZZZZZZ	284531	3.27	1022931	4.31	536258	5.81	755029	7.07	570005	9.44	526270	10.96
ZZZZZZ	272188	3.27	983896	4.31	523811	5.81	746386	7.07	577739	9.44	531264	10.96
ZZZZZZ	243355	3.28	812030	4.32	473558	5.83	755175	7.08	618680	9.46	487189	10.98
ZZZZZZ	224116	3.29	694328	4.36	424741	5.87	759579	7.09	645143	9.46	487804	10.98
ZZZZZZ	241422	3.27	846656	4.31	453419	5.82	656297	7.08	591955	9.45	483138	10.97
ZZZZZZ	216882	3.27	812938	4.31	461642	5.82	726169	7.08	597448	9.45	531968	10.97
ZZZZZZ	222379	3.27	832761	4.31	458688	5.81	720771	7.08	590051	9.45	508570	10.97
ZZZZZZ	243832	3.27	893291	4.31	504816	5.81	767621	7.08	625085	9.45	540886	10.97
ZZZZZZ	237581	3.27	882792	4.31	496838	5.81	766825	7.08	623350	9.45	539233	10.97
ZZZZZZ	223699	3.27	835390	4.31	471804	5.81	735754	7.08	600169	9.44	498009	10.97
ZZZZZZ	242487	3.27	910807	4.31	500865	5.81	769020	7.08	634796	9.45	522001	10.97
OP39286-MB	272984	3.27	1001003	4.31	531882	5.81	754320	7.07	553262	9.44	463172	10.96
OP39286-BS	332459	3.27	1234778	4.31	649066	5.82	950117	7.08	732201	9.45	658893	10.97
ZZZZZZ	325094	3.27	1170523	4.31	626844	5.81	898044	7.07	669277	9.45	579458	10.97
ZZZZZZ	306114	3.27	1115805	4.31	591610	5.81	850314	7.08	664360	9.45	609591	10.97
ZZZZZZ	299471	3.27	1090953	4.31	573073	5.81	837903	7.08	633816	9.45	560575	10.97
ZZZZZZ	313473	3.27	1139964	4.31	613084	5.81	881527	7.08	650084	9.45	538842	10.97
ZZZZZZ	273466	3.27	1002964	4.31	544634	5.81	800133	7.08	673219	9.45	535943	10.99
ZZZZZZ	306473	3.27	1109038	4.31	593954	5.81	844650	7.08	621486	9.45	510189	10.97

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

7.5.3

Semivolatile Internal Standard Area Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSX140-CC106	Injection Date:	08/08/14
Lab File ID:	X04256.D	Injection Time:	07:46
Instrument ID:	GCMSX	Method:	SW846 8270D

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.
(c) Internal standard spiked at 2x concentration.

7.5.3

Semivolatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC32628-2	F75205.D	56	52	58	52	57	70
OP39292-BS	F75201.D	78	72	83	67	73	86
OP39292-BSD	X04257.D	64	69	92	72	75	80
OP39292-MB	F75200.D	70	64	74	64	76	82
OP39292-MS	F75203.D	74	73	68	57	73	79
OP39292-MSD	F75204.D	60	64	71	55	72	80

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.6.1

Semivolatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32628-2	I91197.D	59	57	80
OP39293-BS	I91194.D	78	75	98
OP39293-MB	I91193.D	77	74	94
OP39293-MS	I91195.D	76	73	88
OP39293-MSD	I91196.D	68	68	92

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

7.6.2

New England ACCUTEST LABORATORIES

GC Volatiles

QC Data Summaries

8

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MB	YZ91281.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.72	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.60	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	107%	61-167%
460-00-4	Bromofluorobenzene (S)	107%	61-167%

8.11.1

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MB	BK40149.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-4

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	94%	36-173%
460-00-4	Bromofluorobenzene (S)	94%	36-173%

8.1.2

Method Blank Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-MB	AB85228.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32628-2

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	95%	61-116%

8.1.3

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-BS	YZ91282.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-2

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	33.2	32.3	97	59-142
106-93-4	1,2-Dibromoethane	33.2	33.5	101	56-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	101%	61-167%
460-00-4	Bromofluorobenzene (S)	109%	61-167%

8.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-BS	BK40150.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-4

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.072	101	60-140
106-93-4	1,2-Dibromoethane	0.071	0.071	100	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	91%	36-173%
460-00-4	Bromofluorobenzene (S)	90%	36-173%

8.2.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4535-BSP	AB85229.D	1	08/07/14	AF	n/a	n/a	GAB4535
GAB4535-BSD	AB85230.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32628-2

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	32.0	98	31.9	98	0	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	98%	97%	61-116%

8.3.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MS	YZ91283.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
OP39346-MSD	YZ91284.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
MC32707-2	YZ91285.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-2

CAS No.	Compound	MC32707-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		87.3	91.8	105	84.8	93.0	110	1	40-156/27
106-93-4	1,2-Dibromoethane	ND		87.3	95.7	110	84.8	95.0	112	1	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32707-2	Limits
460-00-4	Bromofluorobenzene (S)	115%	118%	122%	61-167%
460-00-4	Bromofluorobenzene (S)	114%	114%	119%	61-167%

8.4.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MS	BK40151.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
OP39418-MSD	BK40152.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
MC32700-7	BK40153.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32628-4

CAS No.	Compound	MC32700-7 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.067	94	0.071	0.075	106	11	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.072	101	0.071	0.071	100	1	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32700-7	Limits
460-00-4	Bromofluorobenzene (S)	84%	81%	84%	36-173%
460-00-4	Bromofluorobenzene (S)	86%	82%	85%	36-173%

* = Outside of Control Limits.

8.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32521-1MS	AB85233.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1MSD	AB85234.D	1	08/07/14	AF	n/a	n/a	GAB4535
MC32521-1	AB85232.D	1	08/07/14	AF	n/a	n/a	GAB4535

The QC reported here applies to the following samples: Method: SW846 8015

MC32628-2

CAS No.	Compound	MC32521-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	ND		94.1	94.9	101	94.1	95.1	101	0	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC32521-1	Limits
	2,3,4-Trifluorotoluene	101%	100%	98%	61-116%

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32628-4	BK40154.D	82	84
OP39418-BS	BK40150.D	91	90
OP39418-MB	BK40149.D	94	94
OP39418-MS	BK40151.D	84	86
OP39418-MSD	BK40152.D	81	82

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32628-2	YZ91290.D	112	111
OP39346-BS	YZ91282.D	101	109
OP39346-MB	YZ91281.D	107	107
OP39346-MS	YZ91283.D	115	114
OP39346-MSD	YZ91284.D	118	114

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015	Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC32628-2	AB85245.D	98
GAB4535-BSD	AB85230.D	97
GAB4535-BSP	AB85229.D	98
GAB4535-MB	AB85228.D	95
MC32521-1MS	AB85233.D	101
MC32521-1MSD	AB85234.D	100

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.3

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1303-ICC1303	Injection Date:	08/19/14
Lab File ID:	BK40145.D	Injection Time:	16:10
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	2.41	2.72

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39418-MB	BK40149.D	08/19/14	17:05	2.41	2.72
OP39418-BS	BK40150.D	08/19/14	17:19	2.41	2.72
OP39418-MS	BK40151.D	08/19/14	17:32	2.41	2.72
OP39418-MSD	BK40152.D	08/19/14	17:46	2.41	2.72
MC32700-7	BK40153.D	08/19/14	18:00	2.41	2.72
MC32628-4	BK40154.D	08/19/14	18:13	2.41	2.72
ZZZZZZ	BK40155.D	08/19/14	18:27	2.41	2.72
ZZZZZZ	BK40156.D	08/19/14	18:41	2.41	2.72
ZZZZZZ	BK40157.D	08/19/14	18:55	2.41	2.72
ZZZZZZ	BK40158.D	08/19/14	19:08	2.41	2.72
GBK1303-ECC130	BK40159.D	08/19/14	19:22	2.41	2.72

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7620-ICC7620	Injection Date:	08/11/14
Lab File ID:	YZ91278.D	Injection Time:	18:16
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.14	4.39

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39346-MB	YZ91281.D	08/11/14	19:30	4.14	4.39
OP39346-BS	YZ91282.D	08/11/14	19:55	4.14	4.39
OP39346-MS	YZ91283.D	08/11/14	20:20	4.14	4.39
OP39346-MSD	YZ91284.D	08/11/14	20:45	4.14	4.39
MC32707-2	YZ91285.D	08/11/14	21:10	4.14	4.39
ZZZZZZ	YZ91286.D	08/11/14	21:36	4.14	4.39
ZZZZZZ	YZ91287.D	08/11/14	22:00	4.14	4.39
ZZZZZZ	YZ91288.D	08/11/14	22:25	4.14	4.39
ZZZZZZ	YZ91289.D	08/11/14	22:50	4.14	4.39
MC32628-2	YZ91290.D	08/11/14	23:15	4.14	4.39

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227A.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85227.D	Injection Time:	07:43
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.33

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
GAB4535-MB	AB85228.D	08/07/14	08:21	20.33
GAB4536-MB	AB85228A.D	08/07/14	08:21	20.33
GAB4536-BSP	AB85229A.D	08/07/14	08:59	20.32
GAB4535-BSP	AB85229.D	08/07/14	08:59	20.32
GAB4535-BSD	AB85230.D	08/07/14	09:37	20.32
GAB4536-BSD	AB85230A.D	08/07/14	09:37	20.32
MC32468-3	AB85231.D	08/07/14	10:15	20.33
MC32521-1	AB85232.D	08/07/14	10:53	20.33
MC32521-1MS	AB85233.D	08/07/14	11:30	20.32
MC32521-1MSD	AB85234.D	08/07/14	12:08	20.32
MC32468-3MS	AB85235.D	08/07/14	12:45	20.32
MC32468-3MSD	AB85236.D	08/07/14	13:23	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4536-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85237A.D	Injection Time:	14:01
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85238.D	08/07/14	14:38	20.33
ZZZZZZ	AB85239.D	08/07/14	15:16	20.33
ZZZZZZ	AB85240.D	08/07/14	15:54	20.33
ZZZZZZ	AB85241.D	08/07/14	16:31	20.32
ZZZZZZ	AB85242.D	08/07/14	17:08	20.33
ZZZZZZ	AB85243.D	08/07/14	17:45	20.33
ZZZZZZ	AB85244.D	08/07/14	18:22	20.33
MC32628-2	AB85245.D	08/07/14	19:00	20.32
ZZZZZZ	AB85246.D	08/07/14	19:38	20.33
ZZZZZZ	AB85247.D	08/07/14	20:16	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.5

GC Surrogate Retention Time Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4535-CC4488	Injection Date:	08/07/14
Lab File ID:	AB85237.D	Injection Time:	14:01
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85238.D	08/07/14	14:38	20.33
ZZZZZZ	AB85239.D	08/07/14	15:16	20.33
ZZZZZZ	AB85240.D	08/07/14	15:54	20.33
ZZZZZZ	AB85241.D	08/07/14	16:31	20.32
ZZZZZZ	AB85242.D	08/07/14	17:08	20.33
ZZZZZZ	AB85243.D	08/07/14	17:45	20.33
ZZZZZZ	AB85244.D	08/07/14	18:22	20.33
MC32628-2	AB85245.D	08/07/14	19:00	20.32
ZZZZZZ	AB85246.D	08/07/14	19:38	20.33
ZZZZZZ	AB85247.D	08/07/14	20:16	20.33

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

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General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC32628
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC32628-2 Analyzed: 07-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE42-080514(32-34')

Wet Weight (Total)	29.224	g
Tare Weight	21.09	g
Dry Weight (Total)	27.843	g
Solids, Percent	83	%

9.1

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC32660

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 9/4/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE-45-080614 (40-42')	TB-080614-HCL
TB-080614-ST	

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

Yes

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated VOC and SVOC LCS recoveries were outside evaluation criteria. SVOC MS/MSD recoveries were outside of evaluation criteria in sample SVE-45-080614 (40-42'). Additionally, the initial calibration verification recovery for acetone exceeded 30 percent difference (%D). Continuing calibration recovery for 1,2-dibromo-3-chloropropane and 1,2-dibromoethane exceeded 15%D.

The cooler receipt form indicated samples were received by the laboratory at 1.1°C which is outside temperature criteria 4°C ± 2°C. All samples were received in good condition; no qualification of data was required.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

No

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSN3318-BS/BSD	VOCs	Acrolein	79/**66**	17	70-130/25

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSN3318-BS/BSD	VOCs	Dichlorodifluoromethane	70/**64**	9	70-130/25
MSN3318-BS/BSD	VOCs	2-Hexanone	81/**66**	21	70-130/25
OP39310-BS	SVOCs	Hexachlorocyclopentadiene	**21**	NA	40-140

Analytical data that required qualification based on LCS/LCSD data are included in the table below. Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. LCS/LCSD MSN3318-BS/BSD is associated with the trip blank; blanks are quality control samples and are not qualified.

Sample ID	Parameter	Analyte	Qualification
SVE-45-080614 (40-42')	SVOCs	Hexachlorocyclopentadiene	**UJ**

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

Yes

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

Yes, although not requested, sample SVE-45-080614 (40-42') was spiked and analyzed for SVOCs and PAHs.

Were MS/MSD recoveries within evaluation criteria?

No

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE-45-080614 (40-42')	SVOCs	2,4-Dinitrophenol	**13**/**13**	5	30-130/30
SVE-45-080614 (40-42')	SVOCs	4,6-Dinitro-o-cresol	**23**/**26**	11	30-130/30
SVE-45-080614 (40-42')	SVOCs	Hexachlorocyclopentadiene	**19**/**21**	9	40-140/30
SVE-45-080614 (40-42')	SVOCs	Nitrobenzene	48/70	**38**	40-140/30

LCS recoveries were within evaluation criteria with the exception of compounds listed and qualified as appropriate in Section 5.0 of this data review. No further qualification of the data was required.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

Yes

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

No

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; samples analyzed did not require dilution.

12.0 Additional Qualifications

Were additional qualifications applied?

No

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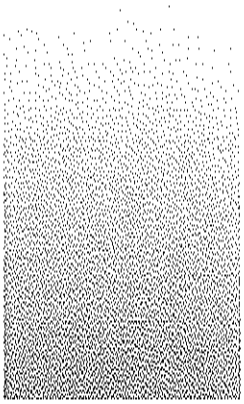
08/22/14



Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

21562973.19200

Accutest Job Number: MC32660

Sampling Date: 08/06/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **84**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Reviewed on 9/4/2014

Reza Tand
Lab Director

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

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Sample Summary

Shell Oil

Job No: MC32660

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC32660-1	08/06/14	14:30	08/07/14	SO	Soil	SVE45-080614 (40-42')
MC32660-2	08/06/14	00:00	08/07/14	AQ	Trip Blank Water	TB-080614 HCL
MC32660-3	08/06/14	00:00	08/07/14	AQ	Trip Blank Water	TB-080614 ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

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SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC32660
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Centr	Report Date	8/21/2014 11:55:32 AM

1 Sample(s) and 2 Trip Blank(s) were collected on 08/06/2014 and were received at Accutest on 08/07/2014 properly preserved, at 1.1 Deg. C and intact. These Samples received an Accutest job number of MC32660. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Sample Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix AQ	Batch ID: MSN3318

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32662-2MS, MC32662-2MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- MSN3318-BSD for Acrolein, Dichlorodifluoromethane, 2-Hexanone: Outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2-Butanone (MEK), 2-Hexanone, Acetone, Acrolein, Dichlorodifluoromethane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2-Butanone (MEK), 2-Hexanone, Acetone, Dichlorodifluoromethane are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Matrix SO	Batch ID: MSK2568

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32795-1MS, MC32795-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Initial calibration verification MSK2552-ICV2552 for acetone (56.8%) exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.
- MC32795-1MS/MSD Recovery(s) for 1,4-Dioxane, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Extractables by GCMS By Method SW846 8270D

Matrix SO	Batch ID: OP39310

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32660-1MS, MC32660-1MSD were used as the QC samples indicated.
- OP39310-BS/MS/MSD Recovery(s) for Hexachlorocyclopentadiene are outside control limits. Blank Spike meets program technical requirements.
- OP39310-MS/MSD Recovery(s) for 2,4-Dinitrophenol, 4,6-Dinitro-o-cresol are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for Nitrobenzene are outside control limits for sample OP39310-MSD. High RPD due to possible matrix interference and/or sample heterogeneity.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix SO	Batch ID: OP39311

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32660-1MS, MC32660-1MSD were used as the QC samples indicated.

Volatiles by GC By Method SW846 8011

Matrix AQ	Batch ID: OP39418

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32700-7MS, MC32700-7MSD were used as the QC samples indicated.
- All samples were analyzed within the recommended method holding time.
- Continuing calibration check standard GBK1303-ECC1303 for 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane exceed 15% Dev (response bias high). Associated samples are non-detect for these analytes.

Matrix SO	Batch ID: OP39346

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32707-2MS, MC32707-2MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Volatiles by GC By Method SW846 8015

Matrix SO	Batch ID: GAB4539

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32660-1MS, MC32660-1MSD were used as the QC samples indicated.
- Calibration standard GAB4486-ICC4486, GAB4486-ICV4486, GAB4540-CC4486 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix SO	Batch ID: GN47968

- Sample(s) MC32660-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC32660).

Summary of Hits

Job Number: MC32660
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/06/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC32660-1	SVE45-080614 (40-42')					
n-Butylbenzene		3.66	0.64	0.031	mg/kg	SW846 8260C
sec-Butylbenzene		0.605 J	0.64	0.096	mg/kg	SW846 8260C
Ethylbenzene		21.4	0.26	0.089	mg/kg	SW846 8260C
Isopropylbenzene		2.08	0.64	0.022	mg/kg	SW846 8260C
p-Isopropyltoluene		0.344 J	0.64	0.022	mg/kg	SW846 8260C
Naphthalene		3.79	0.64	0.051	mg/kg	SW846 8260C
n-Propylbenzene		6.58	0.64	0.020	mg/kg	SW846 8260C
Toluene		7.76	0.64	0.026	mg/kg	SW846 8260C
1,2,4-Trimethylbenzene		33.7	0.64	0.18	mg/kg	SW846 8260C
1,3,5-Trimethylbenzene		9.38	0.64	0.20	mg/kg	SW846 8260C
m,p-Xylene		49.2	0.26	0.056	mg/kg	SW846 8260C
o-Xylene		18.6	0.26	0.036	mg/kg	SW846 8260C
Xylene (total)		67.8	0.26	0.028	mg/kg	SW846 8260C
Total TIC, Volatile		215.9 J			mg/kg	
Acenaphthene		0.0103	0.0058	0.0010	mg/kg	SW846 8270D BY SIM
Acenaphthylene		0.0035 J	0.0058	0.00088	mg/kg	SW846 8270D BY SIM
Anthracene		0.0056 J	0.0058	0.0013	mg/kg	SW846 8270D BY SIM
Fluoranthene		0.0040 J	0.0058	0.0017	mg/kg	SW846 8270D BY SIM
Fluorene		0.0149	0.0058	0.0011	mg/kg	SW846 8270D BY SIM
1-Methylnaphthalene		0.747	0.012	0.0013	mg/kg	SW846 8270D BY SIM
2-Methylnaphthalene		1.63	0.012	0.0011	mg/kg	SW846 8270D BY SIM
Phenanthrene		0.0242	0.0058	0.0012	mg/kg	SW846 8270D BY SIM
Pyrene		0.0067	0.0058	0.0018	mg/kg	SW846 8270D BY SIM
TPH-GRO (VOA)		249	14	2.0	mg/kg	SW846 8015
MC32660-2	TB-080614 HCL					
No hits reported in this sample.						
MC32660-3	TB-080614 ST					
No hits reported in this sample.						

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	K81181.D	1	08/18/14	JM	n/a	n/a	MSK2568
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.81 g	10.0 ml	100 ul
Run #2			

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	1.3	0.36	mg/kg	
107-02-8	Acrolein	ND	3.2	1.1	mg/kg	
107-13-1	Acrylonitrile	ND	3.2	0.35	mg/kg	
71-43-2	Benzene	ND	0.064	0.043	mg/kg	
108-86-1	Bromobenzene	ND	0.64	0.032	mg/kg	
74-97-5	Bromochloromethane	ND	0.64	0.044	mg/kg	
75-27-4	Bromodichloromethane	ND	0.26	0.027	mg/kg	
75-25-2	Bromoform	ND	0.26	0.046	mg/kg	
74-83-9	Bromomethane	ND	0.26	0.077	mg/kg	
78-93-3	2-Butanone (MEK)	ND	1.3	0.40	mg/kg	
104-51-8	n-Butylbenzene	3.66	0.64	0.031	mg/kg	
135-98-8	sec-Butylbenzene	0.605	0.64	0.096	mg/kg	J
98-06-6	tert-Butylbenzene	ND	0.64	0.027	mg/kg	
75-15-0	Carbon disulfide	ND	0.64	0.017	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.26	0.028	mg/kg	
108-90-7	Chlorobenzene	ND	0.26	0.020	mg/kg	
75-00-3	Chloroethane	ND	0.64	0.097	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.64	0.16	mg/kg	
67-66-3	Chloroform	ND	0.26	0.022	mg/kg	
74-87-3	Chloromethane	ND	0.64	0.073	mg/kg	
95-49-8	o-Chlorotoluene	ND	0.64	0.025	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.64	0.034	mg/kg	
124-48-1	Dibromochloromethane	ND	0.26	0.041	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.26	0.027	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.26	0.039	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.26	0.044	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.26	0.10	mg/kg	
75-34-3	1,1-Dichloroethane	ND	0.26	0.034	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.26	0.041	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.26	0.053	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.26	0.058	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.26	0.054	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.26	0.054	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.64	0.042	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.64	0.073	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.64	0.034	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.26	0.029	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.26	0.034	mg/kg	
123-91-1	1,4-Dioxane	ND	3.2	2.6	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.64	0.046	mg/kg	
100-41-4	Ethylbenzene	21.4	0.26	0.089	mg/kg	
87-68-3	Hexachlorobutadiene	ND	0.64	0.074	mg/kg	
591-78-6	2-Hexanone	ND	1.3	0.097	mg/kg	
98-82-8	Isopropylbenzene	2.08	0.64	0.022	mg/kg	
99-87-6	p-Isopropyltoluene	0.344	0.64	0.022	mg/kg	J
1634-04-4	Methyl Tert Butyl Ether	ND	0.26	0.023	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.64	0.069	mg/kg	
74-95-3	Methylene bromide	ND	0.64	0.059	mg/kg	
75-09-2	Methylene chloride	ND	0.26	0.068	mg/kg	
91-20-3	Naphthalene	3.79	0.64	0.051	mg/kg	
103-65-1	n-Propylbenzene	6.58	0.64	0.020	mg/kg	
100-42-5	Styrene	ND	0.64	0.022	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.64	0.052	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.26	0.051	mg/kg	
127-18-4	Tetrachloroethene	ND	0.26	0.040	mg/kg	
108-88-3	Toluene	7.76	0.64	0.026	mg/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	0.64	0.055	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.64	0.066	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.26	0.028	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.26	0.074	mg/kg	
79-01-6	Trichloroethene	ND	0.26	0.031	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.26	0.051	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.64	0.037	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	33.7	0.64	0.18	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	9.38	0.64	0.20	mg/kg	
108-05-4	Vinyl Acetate	ND	0.64	0.20	mg/kg	
75-01-4	Vinyl chloride	ND	0.26	0.12	mg/kg	
	m,p-Xylene	49.2	0.26	0.056	mg/kg	
95-47-6	o-Xylene	18.6	0.26	0.036	mg/kg	
1330-20-7	Xylene (total)	67.8	0.26	0.028	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	107%		70-130%
2037-26-5	Toluene-D8	101%		70-130%
460-00-4	4-Bromofluorobenzene	113%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
107-83-5	Pentane, 2-methyl-	7.33	2.5	mg/kg	JN
565-59-3	Pentane, 2,3-dimethyl-	9.43	15	mg/kg	JN
594-82-1	Butane, 2,2,3,3-tetramethyl-	9.85	32	mg/kg	JN
592-13-2	Hexane, 2,5-dimethyl-	10.58	11	mg/kg	JN
589-43-5	Hexane, 2,4-dimethyl-	10.65	7.8	mg/kg	JN
565-75-3	Pentane, 2,3,4-trimethyl-	11.05	28	mg/kg	JN
2216-34-4	Octane, 4-methyl-	11.20	42	mg/kg	JN
3522-94-9	Hexane, 2,2,5-trimethyl-	11.55	6.2	mg/kg	JN
620-14-4	Benzene, 1-ethyl-3-methyl-	14.60	19	mg/kg	JN
611-14-3	Benzene, 1-ethyl-2-methyl-	14.65	9.3	mg/kg	JN
622-96-8	Benzene, 1-ethyl-4-methyl-	14.93	8.7	mg/kg	JN
526-73-8	Benzene, 1,2,3-trimethyl-	15.63	9.8	mg/kg	JN
4254-29-9	2-Indanol	15.81	10	mg/kg	JN
934-80-5	Benzene, 4-ethyl-1,2-dimethyl-	16.31	7.3	mg/kg	JN
95-93-2	Benzene, 1,2,4,5-tetramethyl-	16.87	7.3	mg/kg	JN
	Total TIC, Volatile		215.9	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8270D SW846 3546	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75282.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312
Run #2							

	Initial Weight	Final Volume
Run #1	20.1 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.58	0.072	mg/kg	
95-57-8	2-Chlorophenol	ND	0.29	0.013	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.58	0.015	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.58	0.017	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.58	0.094	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.2	0.14	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.58	0.072	mg/kg	
95-48-7	2-Methylphenol	ND	0.58	0.023	mg/kg	
	3&4-Methylphenol	ND	0.58	0.028	mg/kg	
88-75-5	2-Nitrophenol	ND	0.58	0.015	mg/kg	
100-02-7	4-Nitrophenol	ND	1.2	0.11	mg/kg	
87-86-5	Pentachlorophenol	ND	0.58	0.041	mg/kg	
108-95-2	Phenol	ND	0.29	0.016	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.58	0.014	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.58	0.014	mg/kg	
62-53-3	Aniline	ND	0.58	0.029	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.29	0.015	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.29	0.012	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.58	0.029	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.29	0.016	mg/kg	
106-47-8	4-Chloroaniline	ND	0.58	0.014	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.29	0.014	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.29	0.018	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.29	0.021	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.29	0.018	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.29	0.013	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.58	0.039	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.58	0.014	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.29	0.029	mg/kg	
132-64-9	Dibenzofuran	ND	0.12	0.016	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.29	0.031	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.29	0.0090	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8270D SW846 3546	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

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ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.29	0.014	mg/kg	
131-11-3	Dimethyl phthalate	ND	0.29	0.017	mg/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.29	0.011	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.29	0.018	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.58	0.14	mg/kg	UJ
67-72-1	Hexachloroethane	ND	0.29	0.014	mg/kg	
78-59-1	Isophorone	ND	0.29	0.013	mg/kg	
88-74-4	2-Nitroaniline	ND	0.58	0.014	mg/kg	
99-09-2	3-Nitroaniline	ND	0.58	0.032	mg/kg	
100-01-6	4-Nitroaniline	ND	0.58	0.014	mg/kg	
98-95-3	Nitrobenzene	ND	0.29	0.016	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.29	0.014	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.29	0.017	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.29	0.017	mg/kg	
110-86-1	Pyridine	ND	0.58	0.029	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	70%		30-130%
4165-62-2	Phenol-d5	59%		30-130%
118-79-6	2,4,6-Tribromophenol	73%		30-130%
4165-60-0	Nitrobenzene-d5	55%		30-130%
321-60-8	2-Fluorobiphenyl	68%		30-130%
1718-51-0	Terphenyl-d14	83%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91192.D	1	08/13/14	MR	08/07/14	OP39311	MSI3395
Run #2							

	Initial Weight	Final Volume
Run #1	20.1 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	0.0103	0.0058	0.0010	mg/kg	
208-96-8	Acenaphthylene	0.0035	0.0058	0.00088	mg/kg	J
120-12-7	Anthracene	0.0056	0.0058	0.0013	mg/kg	J
56-55-3	Benzo(a)anthracene	ND	0.0058	0.0027	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.0058	0.0023	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.0058	0.0026	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.0058	0.0016	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.0058	0.0018	mg/kg	
218-01-9	Chrysene	ND	0.0058	0.0016	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0058	0.0017	mg/kg	
206-44-0	Fluoranthene	0.0040	0.0058	0.0017	mg/kg	J
86-73-7	Fluorene	0.0149	0.0058	0.0011	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0058	0.0014	mg/kg	
90-12-0	1-Methylnaphthalene	0.747	0.012	0.0013	mg/kg	
91-57-6	2-Methylnaphthalene	1.63	0.012	0.0011	mg/kg	
85-01-8	Phenanthrene	0.0242	0.0058	0.0012	mg/kg	
129-00-0	Pyrene	0.0067	0.0058	0.0018	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	69%		30-130%
321-60-8	2-Fluorobiphenyl	66%		30-130%
1718-51-0	Terphenyl-d14	93%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	YZ91292.D	1	08/12/14	SZ	08/11/14	OP39346	GYZ7620
Run #2							

	Initial Weight	Final Volume
Run #1	30.6 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0028	0.00083	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0028	0.00070	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	125%		61-167%
460-00-4	Bromofluorobenzene (S)	119%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE45-080614 (40-42')		
Lab Sample ID:	MC32660-1	Date Sampled:	08/06/14
Matrix:	SO - Soil	Date Received:	08/07/14
Method:	SW846 8015	Percent Solids:	86.2
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85296.D	1	08/11/14	AF	n/a	n/a	GAB4539
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.51 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	249	14	2.0	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	95%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080614 HCL		
Lab Sample ID:	MC32660-2	Date Sampled:	08/06/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	N89565.D	1	08/20/14	KD	n/a	n/a	MSN3318
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080614 HCL		
Lab Sample ID:	MC32660-2	Date Sampled:	08/06/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080614 HCL		
Lab Sample ID:	MC32660-2	Date Sampled:	08/06/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/07/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	87%		70-130%
2037-26-5	Toluene-D8	91%		70-130%
460-00-4	4-Bromofluorobenzene	94%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080614 ST		
Lab Sample ID:	MC32660-3	Date Sampled:	08/06/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/07/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK40155.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
Run #2							

	Initial Volume	Final Volume
Run #1	36.0 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0059	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	83%		36-173%
460-00-4	Bromofluorobenzene (S)	85%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody

Shell Oil Products Chain Of Custody Record

URS

LAB (LOCATION)

Please Check Appropriate Box

Prior Bill To Contact Name: Bob Billman

INCIDENT # (ENV SERVICES): 07214404

DATE: 8/6/2014

PAGE: 1 of 1

PO #:

SAP #: 340001

URS CORPORATION

1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300; ST. LOUIS, MO 63110

Elizabeth Kunkel, Bob Billman

314-429-0100 | 314-429-0462 | bob.billman@urs.com; elizabeth.kunkel@urs.com

SITE ADDRESS: 300 South Central Ave; ROXANA | IL

4th St. Extension Well Install / 21562073.19200

LAB USE ONLY: MC32660

REQUESTED ANALYSIS

Lab Use Only	Field Sample Identification	Sampling Date	Sampling Time	Matrix	Preservative	No. of Cont.	SVOC 8259B SL+TICS Top 15*	VOC 8011 SL	SVOC 8270C SL+TICS	PAH 8270LL	Percent Moisture	TPH-GRO	PID (ppm)	Field Notes / Container PID Readings or Laboratory Notes
1	SVE-45-080914 (40-42')	8/9/2014	1430	S		7	X	X	X	X	X	X	704	
2	TB-080914 HCL			W	2	2	X							
3	TB-080914 SY			W		2		X						
														1K4, 2D
														1055

Relinquished by: [signature] | Received by: FED EX | Date: 8/6/14 | Time: 1830

Relinquished by: FEDEX | Received by: [signature] | Date: 8-7-14 | Time: 833

Relinquished by: | Received by: | Date: | Time:

1,1-

MC32660: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC32660 **Client:** URS **Immediate Client Services Action Required:** No

Date / Time Received: 8/7/2014 **Delivery Method:** **Client Service Action Required at Login:** No

Project: 4TH ST EXT WALL **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y or N		Y or N
1. Custody Seals Present:	☑ ☐	3. COC Present:	☑ ☐
2. Custody Seals Intact:	☑ ☐	4. Smpl Dates/Time OK	☑ ☐

Cooler Temperature	Y or N
1. Temp criteria achieved:	☑ ☐
2. Cooler temp verification:	Infared gun
3. Cooler media:	Ice (bag)

Quality Control Preservation	Y or N	N/A
1. Trip Blank present / cooler:	☑ ☐	☐
2. Trip Blank listed on COC:	☑ ☐	☐
3. Samples preserved properly:	☑ ☐	
4. VOCs headspace free:	☑ ☐	☐

Sample Integrity - Documentation	Y or N
1. Sample labels present on bottles:	☑ ☐
2. Container labeling complete:	☑ ☐
3. Sample container label / COC agree:	☑ ☐

Sample Integrity - Condition	Y or N
1. Sample recvd within HT:	☑ ☐
2. All containers accounted for:	☑ ☐
3. Condition of sample:	Intact

Sample Integrity - Instructions	Y or N	N/A
1. Analysis requested is clear:	☑ ☐	
2. Bottles received for unspecified tests	☐ ☑	
3. Sufficient volume recvd for analysis:	☑ ☐	
4. Compositing instructions clear:	☐ ☐	☑
5. Filtering instructions clear:	☐ ☐	☑

Comments

5.1

MC32660: Chain of Custody
Page 2 of 2

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC32660

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC32660-1 Collected: 06-AUG-14 14:30 By:			Received: 07-AUG-14 By:			
SVE45-080614 (40-42')						
MC32660-1	SW846 8015	11-AUG-14 10:06	AF			V8015GRO
MC32660-1	SW846 8011	12-AUG-14 00:06	SZ	11-AUG-14	AZ	V8011SL
MC32660-1	SW846 8270D	12-AUG-14 12:16	WK	07-AUG-14	FC	AB8270SL+
MC32660-1	SM21 2540 B MOD.	13-AUG-14	HS			%SOL
MC32660-1	SW846 8270D BY SIM	13-AUG-14 08:28	MR	07-AUG-14	FC	B8270SIMSL
MC32660-1	SW846 8260C	18-AUG-14 18:20	JM			V8260SL+
MC32660-2 Collected: 06-AUG-14 00:00 By:			Received: 07-AUG-14 By:			
TB-080614 HCL						
MC32660-2	SW846 8260C	20-AUG-14 12:05	KD			V8260SL+
MC32660-3 Collected: 06-AUG-14 00:00 By:			Received: 07-AUG-14 By:			
TB-080614 ST						
MC32660-3	SW846 8011	19-AUG-14 18:27	AP	14-AUG-14	MT	V8011SL

Accutest Internal Chain of Custody

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/07/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32660-1.1	Walk In Ref #5	Aysia Wood	08/07/14 17:46	Retrieve from Storage
MC32660-1.1	Aysia Wood	Walk In Ref #5	08/07/14 22:00	Return to Storage
MC32660-1.1	Walk In Ref #5	Mehdi Abdolrahim	08/13/14 13:49	Retrieve from Storage
MC32660-1.1	Mehdi Abdolrahim	Walk In Ref #5	08/13/14 13:54	Return to Storage
MC32660-1.2	Walk In Ref #5	Alireza Zeighami	08/11/14 07:36	Retrieve from Storage
MC32660-1.2	Alireza Zeighami	Walk In Ref #5	08/11/14 08:12	Return to Storage
MC32660-1.5	VOC Ref #10	Krysten Dufort	08/08/14 16:22	Retrieve from Storage
MC32660-1.5	Krysten Dufort	VOC Ref #10	08/11/14 10:30	Return to Storage
MC32660-1.7	VOC Ref #10	Jaime Maslowski	08/18/14 09:54	Retrieve from Storage
MC32660-1.7	Jaime Maslowski	VOC Ref #10	08/19/14 09:47	Return to Storage
MC32660-2.1	VOC Ref #1	Krysten Dufort	08/20/14 10:23	Retrieve from Storage
MC32660-2.1	Krysten Dufort	GCMSN	08/20/14 10:23	Load on Instrument
MC32660-2.1	GCMSN	Jaclyn Bergeron	08/21/14 13:00	Unload from Instrument
MC32660-2.1	Jaclyn Bergeron	VOC Ref #1	08/21/14 13:00	Return to Storage
MC32660-3.1	VOC Ref #1	Marc Tahtamoni	08/14/14 20:19	Retrieve from Storage

5.3

New England ACCUTEST LABORATORIES

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-MB	K81164.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	500	140	ug/kg	
107-02-8	Acrolein	ND	1300	440	ug/kg	
107-13-1	Acrylonitrile	ND	1300	140	ug/kg	
71-43-2	Benzene	ND	25	17	ug/kg	
108-86-1	Bromobenzene	ND	250	13	ug/kg	
74-97-5	Bromochloromethane	ND	250	17	ug/kg	
75-27-4	Bromodichloromethane	ND	100	10	ug/kg	
75-25-2	Bromoform	ND	100	18	ug/kg	
74-83-9	Bromomethane	ND	100	30	ug/kg	
78-93-3	2-Butanone (MEK)	ND	500	150	ug/kg	
104-51-8	n-Butylbenzene	ND	250	12	ug/kg	
135-98-8	sec-Butylbenzene	ND	250	37	ug/kg	
98-06-6	tert-Butylbenzene	ND	250	11	ug/kg	
75-15-0	Carbon disulfide	ND	250	6.5	ug/kg	
56-23-5	Carbon tetrachloride	ND	100	11	ug/kg	
108-90-7	Chlorobenzene	ND	100	7.9	ug/kg	
75-00-3	Chloroethane	ND	250	38	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	250	63	ug/kg	
67-66-3	Chloroform	ND	100	8.5	ug/kg	
74-87-3	Chloromethane	ND	250	28	ug/kg	
95-49-8	o-Chlorotoluene	ND	250	9.6	ug/kg	
106-43-4	p-Chlorotoluene	ND	250	13	ug/kg	
124-48-1	Dibromochloromethane	ND	100	16	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	100	11	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	100	15	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	100	17	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	100	40	ug/kg	
75-34-3	1,1-Dichloroethane	ND	100	13	ug/kg	
107-06-2	1,2-Dichloroethane	ND	100	16	ug/kg	
75-35-4	1,1-Dichloroethene	ND	100	21	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	100	23	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	100	21	ug/kg	
78-87-5	1,2-Dichloropropane	ND	100	21	ug/kg	
142-28-9	1,3-Dichloropropane	ND	250	16	ug/kg	
594-20-7	2,2-Dichloropropane	ND	250	28	ug/kg	
563-58-6	1,1-Dichloropropene	ND	250	13	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-MB	K81164.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	100	11	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	100	13	ug/kg	
123-91-1	1,4-Dioxane	ND	1300	1000	ug/kg	
97-63-2	Ethyl methacrylate	ND	250	18	ug/kg	
100-41-4	Ethylbenzene	ND	100	34	ug/kg	
87-68-3	Hexachlorobutadiene	ND	250	29	ug/kg	
591-78-6	2-Hexanone	ND	500	38	ug/kg	
98-82-8	Isopropylbenzene	ND	250	8.4	ug/kg	
99-87-6	p-Isopropyltoluene	ND	250	8.7	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	100	9.1	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	250	27	ug/kg	
74-95-3	Methylene bromide	ND	250	23	ug/kg	
75-09-2	Methylene chloride	ND	100	27	ug/kg	
91-20-3	Naphthalene	ND	250	20	ug/kg	
103-65-1	n-Propylbenzene	ND	250	7.6	ug/kg	
100-42-5	Styrene	ND	250	8.5	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	250	20	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	100	20	ug/kg	
127-18-4	Tetrachloroethene	ND	100	16	ug/kg	
108-88-3	Toluene	ND	250	10	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	250	21	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	250	26	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	100	11	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	100	29	ug/kg	
79-01-6	Trichloroethene	ND	100	12	ug/kg	
75-69-4	Trichlorofluoromethane	ND	100	20	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	250	14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	250	72	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	250	76	ug/kg	
108-05-4	Vinyl Acetate	ND	250	77	ug/kg	
75-01-4	Vinyl chloride	ND	100	45	ug/kg	
	m,p-Xylene	ND	100	22	ug/kg	
95-47-6	o-Xylene	ND	100	14	ug/kg	
1330-20-7	Xylene (total)	ND	100	11	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-MB	K81164.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	103%	70-130%
2037-26-5	Toluene-D8	101%	70-130%
460-00-4	4-Bromofluorobenzene	104%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-MB	N89563.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-MB	N89563.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	0.40	0.40	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	1.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	1.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

6.1.2

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-MB	N89563.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	85%	70-130%
2037-26-5	Toluene-D8	93%	70-130%
460-00-4	4-Bromofluorobenzene	93%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

6.1.2

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-BS	K81161.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
67-64-1	Acetone	2500	2620	105	70-130
107-02-8	Acrolein	12500	12900	103	70-130
107-13-1	Acrylonitrile	2500	2150	86	70-130
71-43-2	Benzene	2500	2220	89	70-130
108-86-1	Bromobenzene	2500	2400	96	70-130
74-97-5	Bromochloromethane	2500	2230	89	70-130
75-27-4	Bromodichloromethane	2500	2510	100	70-130
75-25-2	Bromoform	2500	2220	89	70-130
74-83-9	Bromomethane	2500	2390	96	70-130
78-93-3	2-Butanone (MEK)	2500	2790	112	70-130
104-51-8	n-Butylbenzene	2500	2640	106	70-130
135-98-8	sec-Butylbenzene	2500	2700	108	70-130
98-06-6	tert-Butylbenzene	2500	2740	110	70-130
75-15-0	Carbon disulfide	2500	2590	104	70-130
56-23-5	Carbon tetrachloride	2500	2690	108	70-130
108-90-7	Chlorobenzene	2500	2340	94	70-130
75-00-3	Chloroethane	2500	2770	111	70-130
110-75-8	2-Chloroethyl vinyl ether	2500	2510	100	10-160
67-66-3	Chloroform	2500	2210	88	70-130
74-87-3	Chloromethane	2500	2520	101	70-130
95-49-8	o-Chlorotoluene	2500	2460	98	70-130
106-43-4	p-Chlorotoluene	2500	2410	96	70-130
124-48-1	Dibromochloromethane	2500	2260	90	70-130
95-50-1	1,2-Dichlorobenzene	2500	2320	93	70-130
541-73-1	1,3-Dichlorobenzene	2500	2400	96	70-130
106-46-7	1,4-Dichlorobenzene	2500	2410	96	70-130
75-71-8	Dichlorodifluoromethane	2500	2900	116	70-130
75-34-3	1,1-Dichloroethane	2500	2400	96	70-130
107-06-2	1,2-Dichloroethane	2500	2370	95	70-130
75-35-4	1,1-Dichloroethene	2500	2760	110	70-130
156-59-2	cis-1,2-Dichloroethene	2500	2220	89	70-130
156-60-5	trans-1,2-Dichloroethene	2500	2360	94	70-130
78-87-5	1,2-Dichloropropane	2500	2440	98	70-130
142-28-9	1,3-Dichloropropane	2500	2310	92	70-130
594-20-7	2,2-Dichloropropane	2500	2400	96	70-130
563-58-6	1,1-Dichloropropene	2500	2530	101	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-BS	K81161.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	2500	2460	98	70-130
10061-02-6	trans-1,3-Dichloropropene	2500	2600	104	70-130
123-91-1	1,4-Dioxane	6250	5370	86	70-130
97-63-2	Ethyl methacrylate	2500	2360	94	76-141
100-41-4	Ethylbenzene	2500	2380	95	70-130
87-68-3	Hexachlorobutadiene	2500	2700	108	70-130
591-78-6	2-Hexanone	2500	2260	90	70-130
98-82-8	Isopropylbenzene	2500	2740	110	70-130
99-87-6	p-Isopropyltoluene	2500	2560	102	70-130
1634-04-4	Methyl Tert Butyl Ether	2500	2230	89	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	2500	2350	94	70-130
74-95-3	Methylene bromide	2500	2390	96	70-130
75-09-2	Methylene chloride	2500	2520	101	70-130
91-20-3	Naphthalene	2500	2390	96	70-130
103-65-1	n-Propylbenzene	2500	2620	105	70-130
100-42-5	Styrene	2500	2310	92	70-130
630-20-6	1,1,1,2-Tetrachloroethane	2500	2290	92	70-130
79-34-5	1,1,2,2-Tetrachloroethane	2500	2290	92	70-130
127-18-4	Tetrachloroethene	2500	2410	96	70-130
108-88-3	Toluene	2500	2360	94	70-130
87-61-6	1,2,3-Trichlorobenzene	2500	2450	98	70-130
120-82-1	1,2,4-Trichlorobenzene	2500	2470	99	70-130
71-55-6	1,1,1-Trichloroethane	2500	2400	96	70-130
79-00-5	1,1,2-Trichloroethane	2500	2260	90	70-130
79-01-6	Trichloroethene	2500	2340	94	70-130
75-69-4	Trichlorofluoromethane	2500	2840	114	70-130
96-18-4	1,2,3-Trichloropropane	2500	2310	92	70-130
95-63-6	1,2,4-Trimethylbenzene	2500	2540	102	70-130
108-67-8	1,3,5-Trimethylbenzene	2500	2460	98	70-130
108-05-4	Vinyl Acetate	2500	1750	70	70-130
75-01-4	Vinyl chloride	2500	2570	103	70-130
	m,p-Xylene	5000	4580	92	70-130
95-47-6	o-Xylene	2500	2240	90	70-130
1330-20-7	Xylene (total)	7500	6820	91	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2568-BS	K81161.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	102%	70-130%
2037-26-5	Toluene-D8	106%	70-130%
460-00-4	4-Bromofluorobenzene	104%	70-130%

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-BS	N89560.D	1	08/20/14	KD	n/a	n/a	MSN3318
MSN3318-BSD	N89561.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	50	41.2	82	37.3	75	10	70-130/25
107-02-8	Acrolein	250	197	79	166	66* a	17	70-130/25
107-13-1	Acrylonitrile	50	50.8	102	40.4	81	23	70-130/25
71-43-2	Benzene	50	48.8	98	45.9	92	6	70-130/25
108-86-1	Bromobenzene	50	47.0	94	45.0	90	4	70-130/25
74-97-5	Bromochloromethane	50	50.0	100	46.5	93	7	70-130/25
75-27-4	Bromodichloromethane	50	52.5	105	48.3	97	8	70-130/25
75-25-2	Bromoform	50	49.9	100	44.1	88	12	70-130/25
74-83-9	Bromomethane	50	45.4	91	43.3	87	5	70-130/25
78-93-3	2-Butanone (MEK)	50	47.0	94	36.7	73	25	70-130/25
104-51-8	n-Butylbenzene	50	55.4	111	52.1	104	6	70-130/25
135-98-8	sec-Butylbenzene	50	50.8	102	48.3	97	5	70-130/25
98-06-6	tert-Butylbenzene	50	49.1	98	46.5	93	5	70-130/25
75-15-0	Carbon disulfide	50	49.4	99	45.9	92	7	70-130/25
56-23-5	Carbon tetrachloride	50	52.0	104	47.7	95	9	70-130/25
108-90-7	Chlorobenzene	50	47.6	95	45.9	92	4	70-130/25
75-00-3	Chloroethane	50	52.8	106	48.4	97	9	70-130/25
110-75-8	2-Chloroethyl vinyl ether	50	50.9	102	47.1	94	8	70-130/25
67-66-3	Chloroform	50	46.6	93	42.7	85	9	70-130/25
74-87-3	Chloromethane	50	43.3	87	38.6	77	11	70-130/25
95-49-8	o-Chlorotoluene	50	48.0	96	45.5	91	5	70-130/25
106-43-4	p-Chlorotoluene	50	48.3	97	45.5	91	6	70-130/25
124-48-1	Dibromochloromethane	50	51.7	103	47.6	95	8	70-130/25
95-50-1	1,2-Dichlorobenzene	50	51.4	103	48.4	97	6	70-130/25
541-73-1	1,3-Dichlorobenzene	50	48.7	97	46.8	94	4	70-130/25
106-46-7	1,4-Dichlorobenzene	50	48.7	97	46.2	92	5	70-130/25
75-71-8	Dichlorodifluoromethane	50	34.9	70	31.8	64* a	9	70-130/25
75-34-3	1,1-Dichloroethane	50	50.9	102	46.9	94	8	70-130/25
107-06-2	1,2-Dichloroethane	50	47.5	95	42.6	85	11	70-130/25
75-35-4	1,1-Dichloroethene	50	52.1	104	47.7	95	9	70-130/25
156-59-2	cis-1,2-Dichloroethene	50	46.3	93	42.5	85	9	70-130/25
156-60-5	trans-1,2-Dichloroethene	50	48.6	97	44.3	89	9	70-130/25
78-87-5	1,2-Dichloropropane	50	51.8	104	48.0	96	8	70-130/25
142-28-9	1,3-Dichloropropane	50	46.6	93	43.1	86	8	70-130/25
594-20-7	2,2-Dichloropropane	50	57.3	115	49.6	99	14	70-130/25
563-58-6	1,1-Dichloropropene	50	47.5	95	44.2	88	7	70-130/25

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-BS	N89560.D	1	08/20/14	KD	n/a	n/a	MSN3318
MSN3318-BSD	N89561.D	1	08/20/14	KD	n/a	n/a	MSN3318

6.3.1

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	50	49.0	98	44.9	90	9	70-130/25
10061-02-6	trans-1,3-Dichloropropene	50	55.5	111	49.8	100	11	70-130/25
123-91-1	1,4-Dioxane	125	157	126	130	104	19	70-130/25
97-63-2	Ethyl methacrylate	50	52.4	105	45.0	90	15	77-137/25
100-41-4	Ethylbenzene	50	48.3	97	46.3	93	4	70-130/25
87-68-3	Hexachlorobutadiene	50	53.5	107	50.0	100	7	70-130/25
591-78-6	2-Hexanone	50	40.6	81	33.0	66* a	21	70-130/25
98-82-8	Isopropylbenzene	50	50.4	101	47.8	96	5	70-130/25
99-87-6	p-Isopropyltoluene	50	51.1	102	48.5	97	5	70-130/25
1634-04-4	Methyl Tert Butyl Ether	50	49.0	98	41.2	82	17	70-130/25
108-10-1	4-Methyl-2-pentanone (MIBK)	50	49.3	99	40.5	81	20	70-130/25
74-95-3	Methylene bromide	50	49.2	98	43.7	87	12	70-130/25
75-09-2	Methylene chloride	50	45.8	92	42.1	84	8	70-130/25
91-20-3	Naphthalene	50	49.8	100	39.5	79	23	70-130/25
103-65-1	n-Propylbenzene	50	50.3	101	47.9	96	5	70-130/25
100-42-5	Styrene	50	49.7	99	46.9	94	6	70-130/25
630-20-6	1,1,1,2-Tetrachloroethane	50	46.8	94	44.6	89	5	70-130/25
79-34-5	1,1,2,2-Tetrachloroethane	50	49.2	98	43.4	87	13	70-130/25
127-18-4	Tetrachloroethene	50	49.6	99	47.2	94	5	70-130/25
108-88-3	Toluene	50	49.9	100	47.1	94	6	70-130/25
87-61-6	1,2,3-Trichlorobenzene	50	51.8	104	44.2	88	16	70-130/25
120-82-1	1,2,4-Trichlorobenzene	50	50.1	100	44.9	90	11	70-130/25
71-55-6	1,1,1-Trichloroethane	50	49.4	99	45.3	91	9	70-130/25
79-00-5	1,1,2-Trichloroethane	50	48.7	97	44.7	89	9	70-130/25
79-01-6	Trichloroethene	50	44.0	88	41.6	83	6	70-130/25
75-69-4	Trichlorofluoromethane	50	44.2	88	41.0	82	8	70-130/25
96-18-4	1,2,3-Trichloropropane	50	48.3	97	41.3	83	16	70-130/25
95-63-6	1,2,4-Trimethylbenzene	50	50.1	100	47.2	94	6	70-130/25
108-67-8	1,3,5-Trimethylbenzene	50	47.1	94	45.0	90	5	70-130/25
108-05-4	Vinyl Acetate	50	49.1	98	39.3	79	22	70-130/25
75-01-4	Vinyl chloride	50	40.6	81	36.3	73	11	70-130/25
	m,p-Xylene	100	95.1	95	91.5	92	4	70-130/25
95-47-6	o-Xylene	50	47.6	95	45.3	91	5	70-130/25
1330-20-7	Xylene (total)	150	143	95	137	91	4	70-130/25

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3318-BS	N89560.D	1	08/20/14	KD	n/a	n/a	MSN3318
MSN3318-BSD	N89561.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
1868-53-7	Dibromofluoromethane	88%	84%	70-130%
2037-26-5	Toluene-D8	93%	92%	70-130%
460-00-4	4-Bromofluorobenzene	84%	84%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32795-1MS	K81173.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1MSD	K81174.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1	K81170.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	MC32795-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		3490	3350	96	3490	4350	125	26	70-130/30
107-02-8	Acrolein	ND		17500	16800	96	17500	15600	89	7	70-130/30
107-13-1	Acrylonitrile	ND		3490	3160	90	3490	3110	89	2	70-130/30
71-43-2	Benzene	ND		3490	3250	93	3490	3190	91	2	70-130/30
108-86-1	Bromobenzene	ND		3490	3550	102	3490	3470	99	2	70-130/30
74-97-5	Bromochloromethane	ND		3490	3220	92	3490	3150	90	2	70-130/30
75-27-4	Bromodichloromethane	ND		3490	3610	103	3490	3590	103	1	70-130/30
75-25-2	Bromoform	ND		3490	3240	93	3490	3410	98	5	70-130/30
74-83-9	Bromomethane	ND		3490	3400	97	3490	3340	96	2	70-130/30
78-93-3	2-Butanone (MEK)	ND		3490	3490	100	3490	4160	119	18	70-130/30
104-51-8	n-Butylbenzene	ND		3490	3860	110	3490	3850	110	0	70-130/30
135-98-8	sec-Butylbenzene	ND		3490	3970	114	3490	3790	108	5	70-130/30
98-06-6	tert-Butylbenzene	ND		3490	3890	111	3490	3750	107	4	70-130/30
75-15-0	Carbon disulfide	ND		3490	3490	100	3490	3490	100	0	70-130/30
56-23-5	Carbon tetrachloride	ND		3490	3770	108	3490	3870	111	3	70-130/30
108-90-7	Chlorobenzene	ND		3490	3290	94	3490	3410	98	4	70-130/30
75-00-3	Chloroethane	ND		3490	3770	108	3490	3850	110	2	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		3490	3470	99	3490	3500	100	1	10-160/30
67-66-3	Chloroform	ND		3490	3160	90	3490	3190	91	1	70-130/30
74-87-3	Chloromethane	ND		3490	3480	100	3490	3470	99	0	70-130/30
95-49-8	o-Chlorotoluene	ND		3490	3600	103	3490	3600	103	0	70-130/30
106-43-4	p-Chlorotoluene	ND		3490	3550	102	3490	3420	98	4	70-130/30
124-48-1	Dibromochloromethane	ND		3490	3360	96	3490	3390	97	1	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		3490	3550	102	3490	3420	98	4	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		3490	3440	98	3490	3430	98	0	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		3490	3520	101	3490	3460	99	2	70-130/30
75-71-8	Dichlorodifluoromethane	ND		3490	4120	118	3490	4060	116	1	70-130/30
75-34-3	1,1-Dichloroethane	ND		3490	3420	98	3490	3310	95	3	70-130/30
107-06-2	1,2-Dichloroethane	ND		3490	3370	96	3490	3320	95	1	70-130/30
75-35-4	1,1-Dichloroethene	ND		3490	3740	107	3490	3650	104	2	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		3490	3190	91	3490	2990	86	6	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		3490	3330	95	3490	3200	92	4	70-130/30
78-87-5	1,2-Dichloropropane	ND		3490	3340	96	3490	3400	97	2	70-130/30
142-28-9	1,3-Dichloropropane	ND		3490	3250	93	3490	3270	94	1	70-130/30
594-20-7	2,2-Dichloropropane	ND		3490	3340	96	3490	3360	96	1	70-130/30
563-58-6	1,1-Dichloropropene	ND		3490	3540	101	3490	3440	98	3	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32795-1MS	K81173.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1MSD	K81174.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1	K81170.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Compound	MC32795-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		3490	3410	98	3490	3410	98	0	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		3490	3630	104	3490	3550	102	2	70-130/30
123-91-1	1,4-Dioxane	ND		8730	4820	55* [a]	8730	4430	51* [a]	8	70-130/30
97-63-2	Ethyl methacrylate	ND		3490	3420	98	3490	3490	100	2	41-160/30
100-41-4	Ethylbenzene	ND		3490	3330	95	3490	3420	98	3	70-130/30
87-68-3	Hexachlorobutadiene	ND		3490	3690	106	3490	3750	107	2	70-130/30
591-78-6	2-Hexanone	ND		3490	3600	103	3490	3590	103	0	70-130/30
98-82-8	Isopropylbenzene	ND		3490	3960	113	3490	3800	109	4	70-130/30
99-87-6	p-Isopropyltoluene	ND		3490	3770	108	3490	3660	105	3	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		3490	3140	90	3490	3140	90	0	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		3490	3410	98	3490	3450	99	1	70-130/30
74-95-3	Methylene bromide	ND		3490	3520	101	3490	3380	97	4	70-130/30
75-09-2	Methylene chloride	ND		3490	3310	95	3490	3160	90	5	70-130/30
91-20-3	Naphthalene	ND		3490	3440	98	3490	3390	97	1	70-130/30
103-65-1	n-Propylbenzene	ND		3490	3810	109	3490	3790	108	1	70-130/30
100-42-5	Styrene	ND		3490	3280	94	3490	3380	97	3	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		3490	3260	93	3490	3260	93	0	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		3490	3420	98	3490	3360	96	2	70-130/30
127-18-4	Tetrachloroethene	ND		3490	3440	98	3490	3370	96	2	70-130/30
108-88-3	Toluene	60.2		3490	3420	96	3490	3470	98	1	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		3490	3470	99	3490	3380	97	3	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		3490	3400	97	3490	3490	100	3	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		3490	3500	100	3490	3410	98	3	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		3490	3370	96	3490	3360	96	0	70-130/30
79-01-6	Trichloroethene	ND		3490	3520	101	3490	3470	99	1	70-130/30
75-69-4	Trichlorofluoromethane	ND		3490	4050	116	3490	3930	112	3	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		3490	3450	99	3490	3330	95	4	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		3490	3800	109	3490	3750	107	1	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		3490	3620	104	3490	3540	101	2	70-130/30
108-05-4	Vinyl Acetate	ND		3490	2070	59* [a]	3490	1900	54* [a]	9	70-130/30
75-01-4	Vinyl chloride	ND		3490	3520	101	3490	3470	99	1	70-130/30
	m,p-Xylene	ND		6990	6780	97	6990	6670	95	2	70-130/30
95-47-6	o-Xylene	ND		3490	3170	91	3490	3320	95	5	70-130/30
1330-20-7	Xylene (total)	ND		10500	9950	95	10500	9990	95	0	70-130/30

* = Outside of Control Limits.

6.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32795-1MS	K81173.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1MSD	K81174.D	1	08/18/14	JM	n/a	n/a	MSK2568
MC32795-1	K81170.D	1	08/18/14	JM	n/a	n/a	MSK2568

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-1

CAS No.	Surrogate Recoveries	MS	MSD	MC32795-1	Limits
1868-53-7	Dibromofluoromethane	101%	102%	107%	70-130%
2037-26-5	Toluene-D8	107%	106%	102%	70-130%
460-00-4	4-Bromofluorobenzene	108%	105%	104%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

6.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32662-2MS	N89583.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2MSD	N89584.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2	N89582.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	MC32662-2 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		250	102	41* [a]	250	101	40* [a]	1	70-130/30
107-02-8	Acrolein	ND		1250	822	66* [a]	1250	885	71	7	70-130/30
107-13-1	Acrylonitrile	ND		250	240	96	250	257	103	7	70-130/30
71-43-2	Benzene	ND		250	249	100	250	245	98	2	70-130/30
108-86-1	Bromobenzene	ND		250	243	97	250	238	95	2	70-130/30
74-97-5	Bromochloromethane	ND		250	256	102	250	261	104	2	70-130/30
75-27-4	Bromodichloromethane	ND		250	274	110	250	265	106	3	70-130/30
75-25-2	Bromoform	ND		250	248	99	250	248	99	0	70-130/30
74-83-9	Bromomethane	ND		250	219	88	250	221	88	1	70-130/30
78-93-3	2-Butanone (MEK)	ND		250	168	67* [a]	250	172	69* [a]	2	70-130/30
104-51-8	n-Butylbenzene	ND		250	282	113	250	276	110	2	70-130/30
135-98-8	sec-Butylbenzene	ND		250	255	102	250	252	101	1	70-130/30
98-06-6	tert-Butylbenzene	ND		250	253	101	250	248	99	2	70-130/30
75-15-0	Carbon disulfide	ND		250	262	105	250	268	107	2	70-130/30
56-23-5	Carbon tetrachloride	ND		250	286	114	250	274	110	4	70-130/30
108-90-7	Chlorobenzene	ND		250	241	96	250	236	94	2	70-130/30
75-00-3	Chloroethane	ND		250	239	96	250	237	95	1	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		250	260	104	250	255	102	2	70-130/30
67-66-3	Chloroform	ND		250	240	96	250	239	96	0	70-130/30
74-87-3	Chloromethane	ND		250	183	73	250	188	75	3	70-130/30
95-49-8	o-Chlorotoluene	ND		250	245	98	250	242	97	1	70-130/30
106-43-4	p-Chlorotoluene	ND		250	248	99	250	243	97	2	70-130/30
124-48-1	Dibromochloromethane	ND		250	266	106	250	262	105	2	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		250	264	106	250	258	103	2	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		250	248	99	250	245	98	1	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		250	242	97	250	242	97	0	70-130/30
75-71-8	Dichlorodifluoromethane	ND		250	146	58* [a]	250	144	58* [a]	1	70-130/30
75-34-3	1,1-Dichloroethane	ND		250	260	104	250	263	105	1	70-130/30
107-06-2	1,2-Dichloroethane	ND		250	248	99	250	242	97	2	70-130/30
75-35-4	1,1-Dichloroethene	ND		250	272	109	250	271	108	0	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		250	229	92	250	237	95	3	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		250	243	97	250	248	99	2	70-130/30
78-87-5	1,2-Dichloropropane	ND		250	265	106	250	260	104	2	70-130/30
142-28-9	1,3-Dichloropropane	ND		250	240	96	250	234	94	3	70-130/30
594-20-7	2,2-Dichloropropane	ND		250	273	109	250	268	107	2	70-130/30
563-58-6	1,1-Dichloropropene	ND		250	245	98	250	241	96	2	70-130/30

* = Outside of Control Limits.

6.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32662-2MS	N89583.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2MSD	N89584.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2	N89582.D	1	08/20/14	KD	n/a	n/a	MSN3318

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Compound	MC32662-2 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		250	243	97	250	243	97	0	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		250	276	110	250	275	110	0	70-130/30
123-91-1	1,4-Dioxane	ND		625	699	112	625	699	112	0	70-130/30
97-63-2	Ethyl methacrylate	ND		250	266	106	250	271	108	2	72-139/30
100-41-4	Ethylbenzene	ND		250	247	99	250	241	96	2	70-130/30
87-68-3	Hexachlorobutadiene	ND		250	272	109	250	267	107	2	70-130/30
591-78-6	2-Hexanone	ND		250	145	58* [a]	250	145	58* [a]	0	70-130/30
98-82-8	Isopropylbenzene	1.1	J	250	252	100	250	252	100	0	70-130/30
99-87-6	p-Isopropyltoluene	ND		250	261	104	250	258	103	1	70-130/30
1634-04-4	Methyl Tert Butyl Ether	20.2		250	261	96	250	266	98	2	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		250	247	99	250	238	95	4	70-130/30
74-95-3	Methylene bromide	ND		250	248	99	250	246	98	1	70-130/30
75-09-2	Methylene chloride	ND		250	234	94	250	236	94	1	70-130/30
91-20-3	Naphthalene	ND		250	240	96	250	266	106	10	70-130/30
103-65-1	n-Propylbenzene	0.53	J	250	256	102	250	253	101	1	70-130/30
100-42-5	Styrene	ND		250	247	99	250	244	98	1	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		250	244	98	250	240	96	2	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		250	247	99	250	246	98	0	70-130/30
127-18-4	Tetrachloroethene	ND		250	252	101	250	246	98	2	70-130/30
108-88-3	Toluene	ND		250	256	102	250	248	99	3	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		250	253	101	250	268	107	6	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		250	245	98	250	253	101	3	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		250	260	104	250	256	102	2	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		250	255	102	250	249	100	2	70-130/30
79-01-6	Trichloroethene	ND		250	217	87	250	220	88	1	70-130/30
75-69-4	Trichlorofluoromethane	ND		250	208	83	250	198	79	5	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		250	239	96	250	244	98	2	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		250	248	99	250	246	98	1	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		250	236	94	250	233	93	1	70-130/30
108-05-4	Vinyl Acetate	ND		250	264	106	250	270	108	2	70-130/30
75-01-4	Vinyl chloride	ND		250	176	70	250	182	73	3	70-130/30
	m,p-Xylene	ND		500	483	97	500	473	95	2	70-130/30
95-47-6	o-Xylene	ND		250	245	98	250	236	94	4	70-130/30
1330-20-7	Xylene (total)	ND		750	727	97	750	709	95	3	70-130/30

* = Outside of Control Limits.

6.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32662-2MS	N89583.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2MSD	N89584.D	5	08/20/14	KD	n/a	n/a	MSN3318
MC32662-2	N89582.D	1	08/20/14	KD	n/a	n/a	MSN3318

6.4.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32660-2

CAS No.	Surrogate Recoveries	MS	MSD	MC32662-2	Limits
1868-53-7	Dibromofluoromethane	87%	89%	89%	70-130%
2037-26-5	Toluene-D8	94%	93%	92%	70-130%
460-00-4	4-Bromofluorobenzene	82%	84%	87%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

Volatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSK2568-CC2552	Injection Date:	08/18/14
Lab File ID:	K81160.D	Injection Time:	08:39
Instrument ID:	GCMSK	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	111422	8.78	142863	9.63	60763	12.89	88089	15.44	56045	6.42
Upper Limit [a]	222844	9.28	285726	10.13	121526	13.39	176178	15.94	112090	6.92
Lower Limit [b]	55711	8.28	71432	9.13	30382	12.39	44045	14.94	28023	5.92
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSK2568-BS	115172	8.79	147128	9.63	62653	12.89	82833	15.44	60706	6.43
MSK2568-MB	119614	8.79	152151	9.63	59891	12.89	89512	15.44	60060	6.43
ZZZZZZ	123177	8.78	159530	9.63	61766	12.89	91553	15.44	63488	6.50
ZZZZZZ	114432	8.78	149143	9.63	58383	12.89	87570	15.44	74507	6.57
ZZZZZZ	109039	8.79	142795	9.63	56386	12.89	87348	15.45	49305	6.46
MC32795-1	112504	8.79	143534	9.63	57524	12.89	88854	15.44	44122	6.42
ZZZZZZ	109429	8.78	137427	9.63	55370	12.89	83910	15.44	51801	6.42
ZZZZZZ	113263	8.78	144035	9.63	57761	12.89	82916	15.44	57314	6.42
MC32795-1MS	105025	8.78	134640	9.63	58469	12.89	76189	15.44	56506	6.43
MC32795-1MSD	107058	8.78	136461	9.63	58711	12.89	80086	15.44	53346	6.42
ZZZZZZ	112076	8.78	144990	9.63	55781	12.89	83984	15.44	61872	6.43
ZZZZZZ	114048	8.78	146975	9.63	56918	12.89	85271	15.44	59599	6.43
ZZZZZZ	110772	8.78	139669	9.63	56680	12.89	83773	15.44	60538	6.43
ZZZZZZ	105899	8.78	139594	9.63	54205	12.89	81468	15.44	58354	6.43
ZZZZZZ	109705	8.78	139290	9.63	56492	12.89	84651	15.44	56239	6.43
ZZZZZZ	109119	8.78	141698	9.63	54668	12.89	86386	15.44	58569	6.43
MC32660-1	108056	8.78	139094	9.63	55685	12.89	78358	15.44	58684	6.43
ZZZZZZ	112636	8.78	147975	9.63	56223	12.89	85108	15.44	61592	6.44
ZZZZZZ	109388	8.78	140779	9.63	55773	12.89	79789	15.44	62106	6.41
ZZZZZZ	106677	8.78	137794	9.63	54143	12.89	77178	15.44	56679	6.40
ZZZZZZ	119253	8.79	149727	9.63	56961	12.89	80693	15.44	60317	6.40

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

Volatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSN3318-CC3314	Injection Date:	08/20/14
Lab File ID:	N89560.D	Injection Time:	09:44
Instrument ID:	GCMSN	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	292287	9.12	439970	9.99	252390	13.24	192751	15.80	119215	6.70
Upper Limit [a]	584574	9.62	879940	10.49	504780	13.74	385502	16.30	238430	7.20
Lower Limit [b]	146144	8.62	219985	9.49	126195	12.74	96376	15.30	59608	6.20
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSN3318-BS	292287	9.12	439970	9.99	252390	13.24	192751	15.80	119215	6.70
MSN3318-BSD	299246	9.12	441831	9.99	246875	13.24	186702	15.80	92023	6.70
MSN3318-MB	275246	9.12	402077	9.99	215304	13.24	148303	15.80	120605	6.73
ZZZZZZ	264056	9.12	395589	9.99	213702	13.24	144414	15.80	114476	6.73
MC32660-2	260563	9.12	384420	9.99	208925	13.24	140277	15.80	96191	6.72
ZZZZZZ	248520	9.12	375712	9.99	203380	13.24	138033	15.80	102907	6.73
ZZZZZZ	252874	9.12	377994	9.99	209350	13.24	154006	15.80	105142	6.72
ZZZZZZ	246342	9.12	380170	9.99	200951	13.24	136594	15.80	103603	6.73
ZZZZZZ	249473	9.12	376081	9.99	203730	13.25	137545	15.80	87282	6.72
ZZZZZZ	240651	9.12	360737	9.99	193328	13.24	129959	15.80	92036	6.73
ZZZZZZ	242626	9.12	358401	9.99	196086	13.24	131753	15.80	85772	6.73
ZZZZZZ	239720	9.12	361346	9.99	195103	13.24	143179	15.80	91111	6.73
ZZZZZZ	245765	9.12	364082	9.99	200532	13.24	138274	15.80	103122	6.72
ZZZZZZ	242186	9.12	369238	9.99	200434	13.24	152806	15.80	85044	6.72
ZZZZZZ	244824	9.11	370613	9.99	202369	13.24	147433	15.80	100117	6.73
ZZZZZZ	244589	9.12	370051	9.99	199215	13.24	141705	15.80	105425	6.71
ZZZZZZ	253125	9.12	378833	9.99	202266	13.24	137918	15.80	146903	6.72
ZZZZZZ	245752	9.12	367947	9.99	199784	13.24	135460	15.80	133883	6.72
ZZZZZZ	240780	9.12	363625	9.99	199034	13.24	135292	15.80	102786	6.72
ZZZZZZ	239446	9.12	360329	9.99	193152	13.25	132467	15.80	83669	6.73
MC32662-2	230984	9.12	349968	9.99	188830	13.24	139513	15.80	89102	6.71
MC32662-2MS	253634	9.12	379437	9.99	222366	13.24	171706	15.80	93905	6.70
MC32662-2MSD	282242	9.12	429407	9.99	247555	13.24	187079	15.80	111319	6.70

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32660-2	N89565.D	87	91	94
MC32662-2MS	N89583.D	87	94	82
MC32662-2MSD	N89584.D	89	93	84
MSN3318-BS	N89560.D	88	93	84
MSN3318-BSD	N89561.D	84	92	84
MSN3318-MB	N89563.D	85	93	93

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

Volatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32660-1	K81181.D	107	101	113
MC32795-1MS	K81173.D	101	107	108
MC32795-1MSD	K81174.D	102	106	105
MSK2568-BS	K81161.D	102	106	104
MSK2568-MB	K81164.D	103	101	104

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-MB	F75278.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	480	60	ug/kg	
95-57-8	2-Chlorophenol	ND	240	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	480	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	480	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	480	79	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	970	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	480	60	ug/kg	
95-48-7	2-Methylphenol	ND	480	19	ug/kg	
	3&4-Methylphenol	ND	480	24	ug/kg	
88-75-5	2-Nitrophenol	ND	480	13	ug/kg	
100-02-7	4-Nitrophenol	ND	970	91	ug/kg	
87-86-5	Pentachlorophenol	ND	480	34	ug/kg	
108-95-2	Phenol	ND	240	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	480	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	480	12	ug/kg	
62-53-3	Aniline	ND	480	24	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	240	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	240	9.9	ug/kg	
100-51-6	Benzyl Alcohol	ND	480	24	ug/kg	
91-58-7	2-Chloronaphthalene	ND	240	13	ug/kg	
106-47-8	4-Chloroaniline	ND	480	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	240	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	240	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	240	17	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	240	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	240	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	480	32	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	480	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	240	24	ug/kg	
132-64-9	Dibenzofuran	ND	97	13	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	240	26	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	240	7.5	ug/kg	
84-66-2	Diethyl phthalate	ND	240	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	240	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	240	8.9	ug/kg	
118-74-1	Hexachlorobenzene	ND	240	15	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-MB	F75278.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

7.1.1

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	480	120	ug/kg	
67-72-1	Hexachloroethane	ND	240	12	ug/kg	
78-59-1	Isophorone	ND	240	11	ug/kg	
88-74-4	2-Nitroaniline	ND	480	12	ug/kg	
99-09-2	3-Nitroaniline	ND	480	26	ug/kg	
100-01-6	4-Nitroaniline	ND	480	12	ug/kg	
98-95-3	Nitrobenzene	ND	240	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	240	12	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	240	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	240	15	ug/kg	
110-86-1	Pyridine	ND	480	24	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	75%	30-130%
4165-62-2	Phenol-d5	72%	30-130%
118-79-6	2,4,6-Tribromophenol	79%	30-130%
4165-60-0	Nitrobenzene-d5	58%	30-130%
321-60-8	2-Fluorobiphenyl	77%	30-130%
1718-51-0	Terphenyl-d14	87%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39311-MB	I91185.D	1	08/12/14	MR	08/07/14	OP39311	MSI3394

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.8	0.84	ug/kg	
208-96-8	Acenaphthylene	ND	4.8	0.73	ug/kg	
120-12-7	Anthracene	ND	4.8	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.8	2.2	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.8	1.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.8	2.1	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.8	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.8	1.5	ug/kg	
218-01-9	Chrysene	ND	4.8	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.8	1.4	ug/kg	
206-44-0	Fluoranthene	ND	4.8	1.4	ug/kg	
86-73-7	Fluorene	ND	4.8	0.95	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.8	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	ND	9.7	1.1	ug/kg	
91-57-6	2-Methylnaphthalene	ND	9.7	0.90	ug/kg	
85-01-8	Phenanthrene	ND	4.8	1.0	ug/kg	
129-00-0	Pyrene	ND	4.8	1.5	ug/kg	

CAS No.	Surrogate Recoveries		Limits
4165-60-0	Nitrobenzene-d5	77%	30-130%
321-60-8	2-Fluorobiphenyl	73%	30-130%
1718-51-0	Terphenyl-d14	101%	30-130%

7.1.2

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-BS	F75279.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
65-85-0	Benzoic acid	2410	1740	72	30-130
95-57-8	2-Chlorophenol	2410	1600	66	30-130
59-50-7	4-Chloro-3-methyl phenol	2410	1470	61	30-130
120-83-2	2,4-Dichlorophenol	2410	1490	62	30-130
105-67-9	2,4-Dimethylphenol	2410	1450	60	30-130
51-28-5	2,4-Dinitrophenol	2410	848	35	30-130
534-52-1	4,6-Dinitro-o-cresol	2410	1240	51	30-130
95-48-7	2-Methylphenol	2410	1560	65	30-130
	3&4-Methylphenol	4830	3070	64	30-130
88-75-5	2-Nitrophenol	2410	1560	65	30-130
100-02-7	4-Nitrophenol	2410	1290	53	30-130
87-86-5	Pentachlorophenol	2410	2070	86	30-130
108-95-2	Phenol	2410	1530	63	30-130
95-95-4	2,4,5-Trichlorophenol	2410	1810	75	30-130
88-06-2	2,4,6-Trichlorophenol	2410	1700	70	30-130
62-53-3	Aniline	2410	1290	53	40-140
101-55-3	4-Bromophenyl phenyl ether	2410	1840	76	40-140
85-68-7	Butyl benzyl phthalate	2410	2390	99	40-140
100-51-6	Benzyl Alcohol	2410	1560	65	40-140
91-58-7	2-Chloronaphthalene	2410	1830	76	40-140
106-47-8	4-Chloroaniline	2410	1450	60	40-140
111-91-1	bis(2-Chloroethoxy)methane	2410	1340	56	40-140
111-44-4	bis(2-Chloroethyl)ether	2410	1650	68	40-140
108-60-1	bis(2-Chloroisopropyl)ether	2410	2260	94	40-140
7005-72-3	4-Chlorophenyl phenyl ether	2410	1520	63	40-140
122-66-7	1,2-Diphenylhydrazine	2410	1870	77	40-140
121-14-2	2,4-Dinitrotoluene	2410	1740	72	40-140
606-20-2	2,6-Dinitrotoluene	2410	1630	68	40-140
91-94-1	3,3'-Dichlorobenzidine	2410	2230	92	40-140
132-64-9	Dibenzofuran	2410	1650	68	40-140
84-74-2	Di-n-butyl phthalate	2410	2320	96	40-140
117-84-0	Di-n-octyl phthalate	2410	2270	94	40-140
84-66-2	Diethyl phthalate	2410	1820	75	40-140
131-11-3	Dimethyl phthalate	2410	1850	77	40-140
117-81-7	bis(2-Ethylhexyl)phthalate	2410	2330	97	40-140
118-74-1	Hexachlorobenzene	2410	1780	74	40-140

* = Outside of Control Limits.

7.2.1

7

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-BS	F75279.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
77-47-4	Hexachlorocyclopentadiene	2410	500	21* a	40-140
67-72-1	Hexachloroethane	2410	1400	58	40-140
78-59-1	Isophorone	2410	1320	55	40-140
88-74-4	2-Nitroaniline	2410	1970	82	40-140
99-09-2	3-Nitroaniline	2410	1820	75	40-140
100-01-6	4-Nitroaniline	2410	1740	72	40-140
98-95-3	Nitrobenzene	2410	1280	53	40-140
62-75-9	n-Nitrosodimethylamine	2410	1420	59	40-140
621-64-7	N-Nitroso-di-n-propylamine	2410	1450	60	40-140
86-30-6	N-Nitrosodiphenylamine	2410	1860	77	40-140
110-86-1	Pyridine	2410	1260	52	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	64%	30-130%
4165-62-2	Phenol-d5	63%	30-130%
118-79-6	2,4,6-Tribromophenol	79%	30-130%
4165-60-0	Nitrobenzene-d5	54%	30-130%
321-60-8	2-Fluorobiphenyl	69%	30-130%
1718-51-0	Terphenyl-d14	84%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

7.2.1

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39311-BS	I91186.D	1	08/12/14	MR	08/07/14	OP39311	MSI3394

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2410	1680	70	40-140
208-96-8	Acenaphthylene	2410	1470	61	40-140
120-12-7	Anthracene	2410	1830	76	40-140
56-55-3	Benzo(a)anthracene	2410	2270	94	40-140
50-32-8	Benzo(a)pyrene	2410	2000	83	40-140
205-99-2	Benzo(b)fluoranthene	2410	2400	99	40-140
191-24-2	Benzo(g,h,i)perylene	2410	2040	84	40-140
207-08-9	Benzo(k)fluoranthene	2410	1980	82	40-140
218-01-9	Chrysene	2410	1890	78	40-140
53-70-3	Dibenzo(a,h)anthracene	2410	2200	91	40-140
206-44-0	Fluoranthene	2410	2080	86	40-140
86-73-7	Fluorene	2410	1730	72	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2410	2130	88	40-140
90-12-0	1-Methylnaphthalene	2410	1630	68	40-140
91-57-6	2-Methylnaphthalene	2410	1670	69	40-140
85-01-8	Phenanthrene	2410	1800	75	40-140
129-00-0	Pyrene	2410	2050	85	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
4165-60-0	Nitrobenzene-d5	69%	30-130%
321-60-8	2-Fluorobiphenyl	68%	30-130%
1718-51-0	Terphenyl-d14	94%	30-130%

* = Outside of Control Limits.

7.2.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-MS	F75280.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312
OP39310-MSD	F75281.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312
MC32660-1	F75282.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

CAS No.	Compound	MC32660-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		2870	2270	79	2880	2460	85	8	30-130/30
95-57-8	2-Chlorophenol	ND		2870	1990	69	2880	1940	67	3	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		2870	1810	63	2880	1830	64	1	30-130/30
120-83-2	2,4-Dichlorophenol	ND		2870	1830	64	2880	1800	63	2	30-130/30
105-67-9	2,4-Dimethylphenol	ND		2870	1980	69	2880	1860	65	6	30-130/30
51-28-5	2,4-Dinitrophenol	ND		2870	382	13* a	2880	364	13* a	5	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		2870	665	23* a	2880	744	26* a	11	30-130/30
95-48-7	2-Methylphenol	ND		2870	1880	66	2880	1660	58	12	30-130/30
	3&4-Methylphenol	ND		5730	3690	64	5760	3430	60	7	30-130/30
88-75-5	2-Nitrophenol	ND		2870	1960	68	2880	1870	65	5	30-130/30
100-02-7	4-Nitrophenol	ND		2870	1460	51	2880	1600	56	9	30-130/30
87-86-5	Pentachlorophenol	ND		2870	2200	77	2880	2280	79	4	30-130/30
108-95-2	Phenol	ND		2870	1750	61	2880	1960	68	11	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		2870	2060	72	2880	2270	79	10	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		2870	2090	73	2880	2550	89	20	30-130/30
62-53-3	Aniline	ND		2870	1530	53	2880	1580	55	3	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		2870	2310	81	2880	2230	77	4	40-140/30
85-68-7	Butyl benzyl phthalate	ND		2870	2840	99	2880	2890	100	2	40-140/30
100-51-6	Benzyl Alcohol	ND		2870	1970	69	2880	1710	59	14	40-140/30
91-58-7	2-Chloronaphthalene	ND		2870	2220	77	2880	2120	74	5	40-140/30
106-47-8	4-Chloroaniline	ND		2870	1760	61	2880	1750	61	1	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		2870	1470	51	2880	1800	63	20	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		2870	2010	70	2880	2010	70	0	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		2870	2750	96	2880	2420	84	13	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		2870	1790	62	2880	2090	73	15	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		2870	2510	88	2880	2310	80	8	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		2870	2000	70	2880	2340	81	16	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		2870	1930	67	2880	1970	68	2	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		2870	2680	93	2880	2720	94	1	40-140/30
132-64-9	Dibenzofuran	ND		2870	1930	67	2880	2190	76	13	40-140/30
84-74-2	Di-n-butyl phthalate	ND		2870	2320	81	2880	2340	81	1	40-140/30
117-84-0	Di-n-octyl phthalate	ND		2870	2720	95	2880	2760	96	1	40-140/30
84-66-2	Diethyl phthalate	ND		2870	2120	74	2880	2430	84	14	40-140/30
131-11-3	Dimethyl phthalate	ND		2870	2180	76	2880	2140	74	2	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		2870	2830	99	2880	2820	98	0	40-140/30
118-74-1	Hexachlorobenzene	ND		2870	2110	74	2880	2160	75	2	40-140/30

* = Outside of Control Limits.

7.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39310-MS	F75280.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312
OP39310-MSD	F75281.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312
MC32660-1	F75282.D	1	08/12/14	WK	08/07/14	OP39310	MSF3312

The QC reported here applies to the following samples: Method: SW846 8270D

MC32660-1

7.3.1

CAS No.	Compound	MC32660-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		2870	557	19* b	2880	609	21* b	9	40-140/30
67-72-1	Hexachloroethane	ND		2870	1770	62	2880	1630	57	8	40-140/30
78-59-1	Isophorone	ND		2870	1690	59	2880	1600	56	5	40-140/30
88-74-4	2-Nitroaniline	ND		2870	2310	81	2880	2630	91	13	40-140/30
99-09-2	3-Nitroaniline	ND		2870	2120	74	2880	2420	84	13	40-140/30
100-01-6	4-Nitroaniline	ND		2870	2010	70	2880	2180	76	8	40-140/30
98-95-3	Nitrobenzene	ND		2870	1370	48	2880	2010	70	38* c	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		2870	1700	59	2880	1410	49	19	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		2870	1850	65	2880	1680	58	10	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		2870	2440	85	2880	2270	79	7	40-140/30
110-86-1	Pyridine	ND		2870	1520	53	2880	1290	45	16	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32660-1	Limits
367-12-4	2-Fluorophenol	70%	70%	70%	30-130%
4165-62-2	Phenol-d5	64%	63%	59%	30-130%
118-79-6	2,4,6-Tribromophenol	87%	75%	73%	30-130%
4165-60-0	Nitrobenzene-d5	50%	54%	55%	30-130%
321-60-8	2-Fluorobiphenyl	72%	67%	68%	30-130%
1718-51-0	Terphenyl-d14	82%	83%	83%	30-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.
(b) Outside control limits. Blank Spike meets program technical requirements.
(c) High RPD due to possible matrix interference and/or sample heterogeneity.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39311-MS	I91187.D	1	08/12/14	MR	08/07/14	OP39311	MSI3394
OP39311-MSD	I91188.D	1	08/12/14	MR	08/07/14	OP39311	MSI3394
MC32660-1	I91192.D	1	08/13/14	MR	08/07/14	OP39311	MSI3395

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32660-1

7.3.2

CAS No.	Compound	MC32660-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	10.3		2870	2010	70	2880	2040	71	1	40-140/30
208-96-8	Acenaphthylene	3.5	J	2870	1760	61	2880	1770	61	1	40-140/30
120-12-7	Anthracene	5.6	J	2870	2130	74	2880	2170	75	2	40-140/30
56-55-3	Benzo(a)anthracene	ND		2870	2640	92	2880	2640	92	0	40-140/30
50-32-8	Benzo(a)pyrene	ND		2870	2310	81	2880	2320	81	0	40-140/30
205-99-2	Benzo(b)fluoranthene	ND		2870	2810	98	2880	2760	96	2	40-140/30
191-24-2	Benzo(g,h,i)perylene	ND		2870	2370	83	2880	2350	82	1	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		2870	2270	79	2880	2340	81	3	40-140/30
218-01-9	Chrysene	ND		2870	2200	77	2880	2200	76	0	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		2870	2540	89	2880	2540	88	0	40-140/30
206-44-0	Fluoranthene	4.0	J	2870	2410	84	2880	2460	85	2	40-140/30
86-73-7	Fluorene	14.9		2870	2050	71	2880	2070	71	1	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		2870	2480	86	2880	2460	85	1	40-140/30
90-12-0	1-Methylnaphthalene	747		2870	2710	68	2880	2680	67	1	40-140/30
91-57-6	2-Methylnaphthalene	1630		2870	3620	69	2880	3570	67	1	40-140/30
85-01-8	Phenanthrene	24.2		2870	2110	73	2880	2150	74	2	40-140/30
129-00-0	Pyrene	6.7		2870	2390	83	2880	2440	85	2	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32660-1	Limits
4165-60-0	Nitrobenzene-d5	73%	69%	69%	30-130%
321-60-8	2-Fluorobiphenyl	70%	70%	66%	30-130%
1718-51-0	Terphenyl-d14	91%	93%	93%	30-130%

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL.

Check Std:	MSF3312-CC3270	Injection Date:	08/12/14
Lab File ID:	F75272.D	Injection Time:	08:24
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	158860	2.86	561602	3.88	326601	5.36	563071	6.59	588592	8.85	654175	10.19
Upper Limit [a]	317720	3.36	1123204	4.38	653202	5.86	1126142	7.09	1177184	9.35	1308350	10.69
Lower Limit [b]	79430	2.36	280801	3.38	163301	4.86	281536	6.09	294296	8.35	327088	9.69

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
ZZZZZZ	211132	2.86	861751	3.88	493229	5.35	780219	6.58	743886	8.84	673193	10.19
ZZZZZZ	191298	2.85	688330	3.88	360511	5.35	607421	6.59	659638	8.85	702682	10.20
ZZZZZZ	197299	2.86	678737	3.88	426037	5.35	609053	6.58	619227	8.84	658618	10.19
ZZZZZZ	264373	2.86	885193	3.88	489024	5.35	859275	6.59	832484	8.84	905628	10.20
MC32591-1	204048	2.86	687938	3.88	442302	5.35	692541	6.58	665979	8.84	743574	10.19
OP39310-MB	247549	2.86	840763	3.87	519662	5.35	705770	6.58	683403	8.84	764309	10.19
OP39310-BS	245515	2.86	835713	3.88	461982	5.36	710278	6.59	769600	8.84	694759	10.19
OP39310-MS	246109	2.86	936785	3.88	511970	5.35	694864	6.59	653146	8.84	666218	10.19
OP39310-MSD	286079	2.85	889060	3.88	434959	5.35	740173	6.59	691828	8.84	685699	10.19
MC32660-1	282921	2.86	964722	3.88	475758	5.35	722013	6.58	673254	8.84	676698	10.19
ZZZZZZ	291714	2.86	868398	3.88	483130	5.35	867710	6.58	701225	8.84	822326	10.19
ZZZZZZ	306752	2.86	954239	3.88	470412	5.36	723104	6.58	767983	8.84	714403	10.19
ZZZZZZ	290375	2.85	875967	3.87	484991	5.35	840076	6.58	684145	8.84	675792	10.19
ZZZZZZ	281827	2.85	971926	3.87	528494	5.35	700274	6.58	660980	8.84	661431	10.19
ZZZZZZ	254569	2.86	858188	3.88	469325	5.35	805412	6.59	775079	8.84	770699	10.19
ZZZZZZ	233358	2.85	809979	3.87	455758	5.35	788384	6.58	704593	8.83	652185	10.19
ZZZZZZ	260435	2.86	878169	3.87	449477	5.35	693485	6.58	686474	8.84	690386	10.19
ZZZZZZ	264005	2.86	912551	3.88	463816	5.35	733312	6.58	737236	8.84	673801	10.19
OP39207-MB	195577	2.86	652877	3.87	440515	5.35	792384	6.58	759968	8.84	877505	10.19
OP39207-BS	220946	2.86	680389	3.88	380392	5.35	618225	6.59	677963	8.84	815043	10.19
OP39207-MS	219822	2.86	743401	3.88	408268	5.35	710392	6.59	880572	8.84	889693	10.19
OP39207-MSD	235956	2.86	792294	3.88	397925	5.35	643148	6.59	700885	8.84	749691	10.19
MC32300-11	192039	2.85	761944	3.87	395519	5.35	653984	6.58	852331	8.84	867680	10.19
ZZZZZZ	177577	2.86	765305	3.87	476864	5.35	812902	6.58	891770	8.84	912501	10.19
ZZZZZZ	241084	2.86	843681	3.88	497521	5.35	789895	6.58	783692	8.84	838646	10.19
ZZZZZZ	197296	2.86	709227	3.87	404804	5.35	710726	6.58	875933	8.84	817885	10.19
ZZZZZZ	228036	2.86	784337	3.87	454727	5.35	723003	6.58	717010	8.84	773058	10.19
ZZZZZZ	239661	2.86	818211	3.88	472242	5.35	785905	6.58	851168	8.84	804733	10.19

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

7.4.1

Semivolatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3312-CC3270	Injection Date:	08/12/14
Lab File ID:	F75272.D	Injection Time:	08:24
Instrument ID:	GCMSF	Method:	SW846 8270D

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.1

Semivolatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3394-CC3386	Injection Date:	08/12/14
Lab File ID:	I91158.D	Injection Time:	08:07
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	460339	4.13	1013385	5.18	537346	6.71	915189	8.10	634800	10.88	1621801	12.38
Upper Limit [a]	920678	4.63	2026770	5.68	1074692	7.21	1830378	8.60	1269600	11.38	3243602	12.88
Lower Limit [b]	230170	3.63	506693	4.68	268673	6.21	457595	7.60	317400	10.38	810901	11.88
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
ZZZZZZ	521021	4.13	1152855	5.18	597823	6.71	1000522	8.10	676689	10.88	1751304	12.38
ZZZZZZ	534363	4.13	1178409	5.18	613510	6.71	1018965	8.10	685027	10.88	1734895	12.38
OP39330-MB	489184	4.13	1074984	5.18	571793	6.71	967286	8.10	664675	10.88	1739507	12.38
OP39330-BS	500141	4.13	1106647	5.18	579270	6.71	991820	8.11	694626	10.89	1754215	12.38
OP39330-MS	505892	4.13	1137094	5.18	597454	6.71	1019316	8.11	722467	10.88	1807179	12.38
OP39330-MSD	462014	4.13	1028178	5.18	537906	6.71	919032	8.10	646445	10.88	1621929	12.38
MC32644-12	473435	4.13	1054382	5.18	558960	6.71	938015	8.10	657471	10.88	1702121	12.38
ZZZZZZ	432661	4.13	957154	5.17	506093	6.71	848547	8.10	583286	10.88	1511523	12.38
ZZZZZZ	495264	4.13	1097764	5.18	571786	6.71	963537	8.10	667474	10.88	1710766	12.38
ZZZZZZ	454460	4.13	1013956	5.17	533555	6.71	897329	8.10	620846	10.88	1616167	12.38
ZZZZZZ	451567	4.13	1004981	5.17	530984	6.71	902996	8.10	621995	10.88	1606193	12.38
ZZZZZZ	461056	4.13	1020264	5.17	534254	6.71	910179	8.10	624629	10.88	1619279	12.38
ZZZZZZ	505873	4.13	1137533	5.17	608320	6.71	1029086	8.10	713664	10.88	1821818	12.38
ZZZZZZ	493473	4.13	1109661	5.17	593534	6.71	999719	8.10	696333	10.88	1766009	12.38
ZZZZZZ	485230	4.13	1084469	5.17	576187	6.71	982189	8.10	679898	10.88	1746360	12.38
ZZZZZZ	491741	4.13	1100637	5.18	582671	6.71	983425	8.10	689262	10.88	1759737	12.38
ZZZZZZ	515736	4.13	1153855	5.17	610541	6.71	1030633	8.10	712463	10.88	1820652	12.38
ZZZZZZ	514722	4.13	1147612	5.17	605819	6.71	1013072	8.10	701048	10.88	1801640	12.38
ZZZZZZ	534322	4.13	1192042	5.17	636891	6.71	1068535	8.10	741412	10.88	1884613	12.38
ZZZZZZ	481801	4.13	1070750	5.17	567563	6.71	958138	8.10	664814	10.88	1710005	12.38
ZZZZZZ	460429	4.13	1027417	5.17	545404	6.71	916481	8.10	635286	10.88	1634745	12.37
ZZZZZZ	461480	4.13	1020803	5.17	537514	6.71	909000	8.10	633945	10.88	1644612	12.38
ZZZZZZ	492538	4.13	1094640	5.17	586929	6.71	992438	8.10	693314	10.88	1775909	12.38
ZZZZZZ	494358	4.13	1098747	5.17	583420	6.71	993735	8.10	693483	10.88	1785047	12.38
ZZZZZZ	513546	4.13	1143735	5.17	611491	6.71	1041615	8.10	723583	10.88	1826996	12.38
OP39311-MB	503870	4.13	1113075	5.17	583547	6.71	968612	8.10	644360	10.88	1597081	12.37
OP39311-BS	487729	4.13	1067846	5.18	556529	6.71	936923	8.10	632443	10.88	1541238	12.38
OP39311-MS	460193	4.13	1001080	5.18	525218	6.71	891497	8.10	605724	10.88	1493106	12.38
OP39311-MSD	516184	4.13	1119581	5.18	586725	6.71	983042	8.10	657137	10.88	1586361	12.38

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12

7.4.2

Semivolatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3394-CC3386	Injection Date:	08/12/14
Lab File ID:	I91158.D	Injection Time:	08:07
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.2

Semivolatile Internal Standard Area Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3395-CC3386	Injection Date:	08/13/14
Lab File ID:	I91191.D	Injection Time:	08:05
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT
Check Std	447253	4.11	975761	5.16	513094	6.69	871613	8.08	610546	10.85	1551996	12.34
Upper Limit [a]	894506	4.61	1951522	5.66	1026188	7.19	1743226	8.58	1221092	11.35	3103992	12.84
Lower Limit [b]	223627	3.61	487881	4.66	256547	6.19	435807	7.58	305273	10.35	775998	11.84
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
MC32660-1	507137	4.10	1084237	5.16	568193	6.69	942660	8.08	626812	10.85	1617411	12.34
OP39293-MB	494701	4.11	1090832	5.16	566062	6.69	948781	8.08	631666	10.85	1585693	12.34
OP39293-BS	588769	4.11	1267065	5.16	653267	6.69	1080304	8.08	743701	10.86	1767654	12.35
OP39293-MS	503185	4.11	1085578	5.16	552507	6.69	911928	8.08	600305	10.85	1483414	12.34
OP39293-MSD	550135	4.11	1195700	5.16	607562	6.69	994336	8.08	654750	10.86	1626732	12.35
MC32628-2	555248	4.11	1220109	5.16	630036	6.69	1043936	8.08	680757	10.85	1735230	12.34
OP39356-MB	435653	4.11	963221	5.16	506097	6.69	849308	8.08	592632	10.85	1530979	12.34
OP39356-BS	458324	4.11	1009873	5.16	523460	6.69	872358	8.08	603586	10.85	1519524	12.34
OP39356-MS	454819	4.09	1001843	5.15	520945	6.69	863638	8.08	597521	10.85	1506939	12.34
OP39356-MSD	476030	4.11	1050582	5.16	542305	6.69	893006	8.08	615421	10.86	1542520	12.35
MC32762-3	427900	4.11	950806	5.16	501819	6.69	843346	8.08	577192	10.85	1494012	12.34
ZZZZZZ	432590	4.11	968953	5.16	505827	6.69	848352	8.08	586866	10.85	1515051	12.34
ZZZZZZ	430155	4.11	955854	5.16	500599	6.69	838315	8.08	577736	10.85	1493924	12.34

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.3

Semivolatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC32660-1	F75282.D	70	59	73	55	68	83
OP39310-BS	F75279.D	64	63	79	54	69	84
OP39310-MB	F75278.D	75	72	79	58	77	87
OP39310-MS	F75280.D	70	64	87	50	72	82
OP39310-MSD	F75281.D	70	63	75	54	67	83

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.5.1

Semivolatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32660-1	I91192.D	69	66	93
OP39311-BS	I91186.D	69	68	94
OP39311-MB	I91185.D	77	73	101
OP39311-MS	I91187.D	73	70	91
OP39311-MSD	I91188.D	69	70	93

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

7.5.2

New England ACCUTEST LABORATORIES

GC Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MB	YZ91281.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.72	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.60	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	107%	61-167%
460-00-4	Bromofluorobenzene (S)	107%	61-167%

8.1.1

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MB	BK40149.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-3

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	94%	36-173%
460-00-4	Bromofluorobenzene (S)	94%	36-173%

8.1.2

Method Blank Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4539-MB	AB85293.D	1	08/11/14	AF	n/a	n/a	GAB4539

The QC reported here applies to the following samples: Method: SW846 8015

MC32660-1

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	93%	61-116%

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-BS	YZ91282.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	33.2	32.3	97	59-142
106-93-4	1,2-Dibromoethane	33.2	33.5	101	56-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	101%	61-167%
460-00-4	Bromofluorobenzene (S)	109%	61-167%

8.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-BS	BK40150.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.072	101	60-140
106-93-4	1,2-Dibromoethane	0.071	0.071	100	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	91%	36-173%
460-00-4	Bromofluorobenzene (S)	90%	36-173%

8.2.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4539-BSP	AB85294.D	1	08/11/14	AF	n/a	n/a	GAB4539
GAB4539-BSD	AB85295.D	1	08/11/14	AF	n/a	n/a	GAB4539

The QC reported here applies to the following samples: Method: SW846 8015

MC32660-1

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	32.1	99	32.2	99	0	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	98%	99%	61-116%

8.3.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MS	YZ91283.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
OP39346-MSD	YZ91284.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
MC32707-2	YZ91285.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-1

CAS No.	Compound	MC32707-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		87.3	91.8	105	84.8	93.0	110	1	40-156/27
106-93-4	1,2-Dibromoethane	ND		87.3	95.7	110	84.8	95.0	112	1	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32707-2	Limits
460-00-4	Bromofluorobenzene (S)	115%	118%	122%	61-167%
460-00-4	Bromofluorobenzene (S)	114%	114%	119%	61-167%

* = Outside of Control Limits.

8.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MS	BK40151.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
OP39418-MSD	BK40152.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
MC32700-7	BK40153.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32660-3

CAS No.	Compound	MC32700-7 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.067	94	0.071	0.075	106	11	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.072	101	0.071	0.071	100	1	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32700-7	Limits
460-00-4	Bromofluorobenzene (S)	84%	81%	84%	36-173%
460-00-4	Bromofluorobenzene (S)	86%	82%	85%	36-173%

* = Outside of Control Limits.

8.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32660-1MS	AB85297.D	1	08/11/14	AF	n/a	n/a	GAB4539
MC32660-1MSD	AB85298.D	1	08/11/14	AF	n/a	n/a	GAB4539
MC32660-1	AB85296.D	1	08/11/14	AF	n/a	n/a	GAB4539

The QC reported here applies to the following samples: Method: SW846 8015

MC32660-1

CAS No.	Compound	MC32660-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	249		88.8	378	145	88.8	374	141	1	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC32660-1	Limits
	2,3,4-Trifluorotoluene	97%	95%	95%	61-116%

8.4.3

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32660-3	BK40155.D	83	85
OP39418-BS	BK40150.D	91	90
OP39418-MB	BK40149.D	94	94
OP39418-MS	BK40151.D	84	86
OP39418-MSD	BK40152.D	81	82

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32660-1	YZ91292.D	125	119
OP39346-BS	YZ91282.D	101	109
OP39346-MB	YZ91281.D	107	107
OP39346-MS	YZ91283.D	115	114
OP39346-MSD	YZ91284.D	118	114

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015	Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC32660-1	AB85296.D	95
GAB4539-BSD	AB85295.D	99
GAB4539-BSP	AB85294.D	98
GAB4539-MB	AB85293.D	93
MC32660-1MS	AB85297.D	97
MC32660-1MSD	AB85298.D	95

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.3

GC Surrogate Retention Time Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4540-CC4486	Injection Date:	08/11/14
Lab File ID:	AB85292A.D	Injection Time:	07:33
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std	20.32	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GAB4539-MB	AB85293.D	08/11/14	08:11		20.32
GAB4540-MB	AB85293A.D	08/11/14	08:11	20.32	20.32
GAB4540-BSP	AB85294A.D	08/11/14	08:49	20.32	20.32
GAB4539-BSP	AB85294.D	08/11/14	08:49		20.32
GAB4540-BSD	AB85295A.D	08/11/14	09:28	20.32	20.32
GAB4539-BSD	AB85295.D	08/11/14	09:28		20.32
MC32660-1	AB85296.D	08/11/14	10:06		20.32
MC32660-1MS	AB85297.D	08/11/14	10:44		20.32
MC32660-1MSD	AB85298.D	08/11/14	11:21		20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1303-ICC1303	Injection Date:	08/19/14
Lab File ID:	BK40145.D	Injection Time:	16:10
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	2.41	2.72

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39418-MB	BK40149.D	08/19/14	17:05	2.41	2.72
OP39418-BS	BK40150.D	08/19/14	17:19	2.41	2.72
OP39418-MS	BK40151.D	08/19/14	17:32	2.41	2.72
OP39418-MSD	BK40152.D	08/19/14	17:46	2.41	2.72
MC32700-7	BK40153.D	08/19/14	18:00	2.41	2.72
ZZZZZZ	BK40154.D	08/19/14	18:13	2.41	2.72
MC32660-3	BK40155.D	08/19/14	18:27	2.41	2.72
ZZZZZZ	BK40156.D	08/19/14	18:41	2.41	2.72
ZZZZZZ	BK40157.D	08/19/14	18:55	2.41	2.72
ZZZZZZ	BK40158.D	08/19/14	19:08	2.41	2.72
GBK1303-ECC130	BK40159.D	08/19/14	19:22	2.41	2.72

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7620-ICC7620	Injection Date:	08/11/14
Lab File ID:	YZ91278.D	Injection Time:	18:16
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.14	4.39

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39346-MB	YZ91281.D	08/11/14	19:30	4.14	4.39
OP39346-BS	YZ91282.D	08/11/14	19:55	4.14	4.39
OP39346-MS	YZ91283.D	08/11/14	20:20	4.14	4.39
OP39346-MSD	YZ91284.D	08/11/14	20:45	4.14	4.39
MC32707-2	YZ91285.D	08/11/14	21:10	4.14	4.39
ZZZZZZ	YZ91286.D	08/11/14	21:36	4.14	4.39
ZZZZZZ	YZ91287.D	08/11/14	22:00	4.14	4.39
ZZZZZZ	YZ91288.D	08/11/14	22:25	4.14	4.39
ZZZZZZ	YZ91289.D	08/11/14	22:50	4.14	4.39
ZZZZZZ	YZ91290.D	08/11/14	23:15	4.14	4.39

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7620-CC7620	Injection Date:	08/11/14
Lab File ID:	YZ91291.D	Injection Time:	23:41
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.14	4.39

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
MC32660-1	YZ91292.D	08/12/14	00:06	4.14	4.39
ZZZZZZ	YZ91293.D	08/12/14	00:31	4.14	4.39
ZZZZZZ	YZ91294.D	08/12/14	00:57	4.14	4.38
GYZ7620-ECC762W	YZ91295.D	08/12/14	01:21	4.14	4.39

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4539-CC4488	Injection Date:	08/11/14
Lab File ID:	AB85292.D	Injection Time:	07:33
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std		20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GAB4539-MB	AB85293.D	08/11/14	08:11		20.32
GAB4540-MB	AB85293A.D	08/11/14	08:11	20.32	20.32
GAB4540-BSP	AB85294A.D	08/11/14	08:49	20.32	20.32
GAB4539-BSP	AB85294.D	08/11/14	08:49		20.32
GAB4540-BSD	AB85295A.D	08/11/14	09:28	20.32	20.32
GAB4539-BSD	AB85295.D	08/11/14	09:28		20.32
MC32660-1	AB85296.D	08/11/14	10:06		20.32
MC32660-1MS	AB85297.D	08/11/14	10:44		20.32
MC32660-1MSD	AB85298.D	08/11/14	11:21		20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

New England ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC32660
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC32660-1 Analyzed: 13-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE45-080614 (40-42')

Wet Weight (Total)	32.235	g
Tare Weight	21.266	g
Dry Weight (Total)	30.721	g
Solids, Percent	86.2	%

9.1

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC32763

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 9/4/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE-43-080814 (30-32')	TB-080814-HCL
TB-080814-ST	

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

Yes

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated 1-methylnaphthalene was detected in the method blank. VOC and SVOC LCS recoveries were outside evaluation criteria. SVOC MS/MSD recoveries were outside of evaluation criteria in sample SVE-43-080814 (30-32'). Additionally, the initial calibration verification recovery for 1,4-dioxane exceeded 30 percent difference (%D). Continuing calibration recovery for 1,4-dioxane exceeded 40%D, and 1,2-dibromo-3-chloropropane exceeded 15%D.

The cooler receipt form did not indicate any problems.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

Yes

Blank ID	Parameter	Analyte	Concentration/ Amount
OP39348-MB	PAHs	1-Methylnaphthalene	0.0013 mg/L

Analytical data that were reported non-detect or at concentrations greater than five times (5X) the associated blank concentration did not require qualification. No qualification of data was required.

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSN3320-BS	VOCs	Acrolein	**64**	NA	70-130
MSN3320-BS	VOCs	Bromomethane	**69**	NA	70-130
MSN3320-BS	VOCs	Dichlorodifluoromethane	**65**	NA	70-130
OP39349-BS	SVOCs	2,4-Dinitrophenol	**22**	NA	30-130
OP39349-BS	SVOCs	4,6-Dinitro-o-cresol	**29**	NA	30-130
OP39349-BS	SVOCs	Benzyl alcohol	**19**	NA	40-140
OP39349-BS	SVOCs	Hexachlorocyclopentadiene	**21**	NA	40-140

Analytical data that required qualification based on LCS/LCSD data are included in the table below. Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. LCS MSN3320-BS is associated with the trip blank; blanks are quality control samples and are not qualified.

Sample ID	Parameter	Analyte	Qualification
SVE-43-080814 (30-32')	SVOCs	2,4-Dinitrophenol	**UJ**
SVE-43-080814 (30-32')	SVOCs	4,6-Dinitro-o-cresol	**UJ**
SVE-43-080814 (30-32')	SVOCs	Benzyl alcohol	**UJ**
SVE-43-080814 (30-32')	SVOCs	Hexachlorocyclopentadiene	**UJ**

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

Yes

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

Yes, although not requested, sample SVE-43-080814 (30-32') was spiked and analyzed for SVOCs and PAHs.

Were MS/MSD recoveries within evaluation criteria?

No

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE-43-080814 (30-32')	SVOCs	Benzoic acid	56/123	**74**	30-130/30
SVE-43-080814 (30-32')	SVOCs	2,4-Dinitrophenol	**0/0**	NA	30-130/30
SVE-43-080814 (30-32')	SVOCs	4,6-Dinitro-o-cresol	**17/20**	15	30-130/30

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE-43-080814 (30-32')	SVOCs	4-Nitrophenol	**0**/**0**	NA	30-130/30
SVE-43-080814 (30-32')	SVOCs	Benzyl alcohol	**19**/**23**	16	40-140/30
SVE-43-080814 (30-32')	SVOCs	Hexachlorocyclopentadiene	**12**/**12**	0	40-140/30
SVE-43-080814 (30-32')	SVOCs	Pyridine	50/**39**	26	40-140/30

LCS recoveries were within evaluation criteria with the exception of compounds listed and qualified as appropriate in Section 5.0 of this data review. No further qualification of the data was required.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

Yes

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

No

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; samples analyzed did not require dilution.

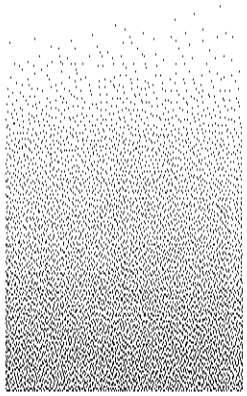
12.0 Additional Qualifications

Were additional qualifications applied?

No

New England ACCUTEST LABORATORIES

09/04/14



Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

21562973.19200

Accutest Job Number: MC32763

Sampling Date: 08/08/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **83**

Reviewed on 9/4/2014

Reza Tand
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

Table of Contents

Sample Summary

Shell Oil

Job No: MC32763

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC32763-1	08/08/14	13:00	08/09/14	SO	Soil	SVE43-080814 (30-32')
MC32763-2	08/08/14	00:00	08/09/14	AQ	Trip Blank Water	TB-080814 HCL
MC32763-3	08/08/14	00:00	08/09/14	AQ	Trip Blank Water	TB-080814 ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

ACCUTEST LABORATORIES

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC32763
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Centr	Report Date	8/25/2014 9:48:16 AM

1 Sample(s), 2 Trip Blank(s) were collected on 08/08/2014 and were received at Accutest on 08/09/2014 properly preserved, at 2.1 Deg. C and intact. These Samples received an Accutest job number of MC32763. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix AQ	Batch ID: MSN3320

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32987-1MS, MC32987-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Initial calibration verification MSK2552-ICV2552 for acetone (56.8%) exceeds 30% Difference (response bias high). Associated sample is non-detect for this compound.
- Blank Spike Recovery(s) for Acrolein, Bromomethane, Dichlorodifluoromethane are outside control limits. Blank Spike meets program technical requirements.
- MC32987-1MS/MSD Recovery(s) for 2-Butanone (MEK), 2-Hexanone, Acetone, Acrolein are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Matrix SO	Batch ID: MSK2572

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32899-1MS, MC32899-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- MC32899-1MS/MSD Recovery(s) for 1,4-Dioxane, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Extractables by GCMS By Method SW846 8270D

Matrix SO	Batch ID: OP39349

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32763-1MS, MC32763-1MSD were used as the QC samples indicated.
- OP39349-BS/MS/MSD Recovery(s) for 2,4-Dinitrophenol, 4,6-Dinitro-o-cresol, Benzyl Alcohol, Hexachlorocyclopentadiene are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 4-Nitrophenol is outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 4-Nitrophenol, Pyridine are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD(s) for MSD for Benzoic acid are outside control limits for sample OP39349-MSD. High RPD due to possible matrix interference and/or sample heterogeneity.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix SO	Batch ID: OP39348

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32763-1MS, MC32763-1MSD were used as the QC samples indicated.

Volatiles by GC By Method SW846 8011

Matrix AQ	Batch ID: OP39418

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC32700-7MS, MC32700-7MSD were used as the QC samples indicated.
- Continuing calibration check standard GBK1303-ICC1303 for 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane exceed 15% Dev (response bias high). Associated samples are non-detect for these analytes.

Matrix SO	Batch ID: OP39346

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32707-2MS, MC32707-2MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Volatiles by GC By Method SW846 8015

Matrix SO	Batch ID: GAB4541

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC32787-1MS, MC32787-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Calibration standard GAB4486-ICC4486, GAB4486-ICV4486, GAB4540-CC4486, GAB4542-CC4486 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix SO	Batch ID: GN47982

- Sample(s) MC32763-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC32763).

Summary of Hits

Job Number: MC32763
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/08/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC32763-1	SVE43-080814 (30-32')					
n-Butylbenzene		0.648 J	0.71	0.034	mg/kg	SW846 8260C
sec-Butylbenzene		0.573 J	0.71	0.11	mg/kg	SW846 8260C
Isopropylbenzene		0.307 J	0.71	0.024	mg/kg	SW846 8260C
p-Isopropyltoluene		0.162 J	0.71	0.025	mg/kg	SW846 8260C
n-Propylbenzene		0.569 J	0.71	0.022	mg/kg	SW846 8260C
Total TIC, Volatile		32.1 J			mg/kg	
Acenaphthene		0.238	0.0058	0.0010	mg/kg	SW846 8270D BY SIM
Acenaphthylene		0.0517	0.0058	0.00088	mg/kg	SW846 8270D BY SIM
Anthracene		0.189	0.0058	0.0013	mg/kg	SW846 8270D BY SIM
Benzo(a)anthracene		0.0230	0.0058	0.0027	mg/kg	SW846 8270D BY SIM
Benzo(a)pyrene		0.0036 J	0.0058	0.0023	mg/kg	SW846 8270D BY SIM
Benzo(b)fluoranthene		0.0046 J	0.0058	0.0026	mg/kg	SW846 8270D BY SIM
Chrysene		0.0446	0.0058	0.0016	mg/kg	SW846 8270D BY SIM
Fluoranthene		0.0589	0.0058	0.0017	mg/kg	SW846 8270D BY SIM
Fluorene		0.373	0.0058	0.0011	mg/kg	SW846 8270D BY SIM
1-Methylnaphthalene		2.82	0.012	0.0013	mg/kg	SW846 8270D BY SIM
Phenanthrene		1.56	0.0058	0.0012	mg/kg	SW846 8270D BY SIM
Pyrene		0.144	0.0058	0.0018	mg/kg	SW846 8270D BY SIM
TPH-GRO (VOA)		156	14	2.1	mg/kg	SW846 8015
MC32763-2	TB-080814 HCL					
No hits reported in this sample.						
MC32763-3	TB-080814 ST					
No hits reported in this sample.						

New England ACCUTEST LABORATORIES

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	K81283.D	1	08/20/14	JM	n/a	n/a	MSK2572
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.48 g	10.0 ml	100 ul
Run #2			

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	1.4	0.40	mg/kg	
107-02-8	Acrolein	ND	3.6	1.2	mg/kg	
107-13-1	Acrylonitrile	ND	3.6	0.39	mg/kg	
71-43-2	Benzene	ND	0.071	0.048	mg/kg	
108-86-1	Bromobenzene	ND	0.71	0.036	mg/kg	
74-97-5	Bromochloromethane	ND	0.71	0.049	mg/kg	
75-27-4	Bromodichloromethane	ND	0.28	0.030	mg/kg	
75-25-2	Bromoform	ND	0.28	0.050	mg/kg	
74-83-9	Bromomethane	ND	0.28	0.086	mg/kg	
78-93-3	2-Butanone (MEK)	ND	1.4	0.44	mg/kg	
104-51-8	n-Butylbenzene	0.648	0.71	0.034	mg/kg	J
135-98-8	sec-Butylbenzene	0.573	0.71	0.11	mg/kg	J
98-06-6	tert-Butylbenzene	ND	0.71	0.030	mg/kg	
75-15-0	Carbon disulfide	ND	0.71	0.019	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.28	0.031	mg/kg	
108-90-7	Chlorobenzene	ND	0.28	0.022	mg/kg	
75-00-3	Chloroethane	ND	0.71	0.11	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.71	0.18	mg/kg	
67-66-3	Chloroform	ND	0.28	0.024	mg/kg	
74-87-3	Chloromethane	ND	0.71	0.080	mg/kg	
95-49-8	o-Chlorotoluene	ND	0.71	0.027	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.71	0.038	mg/kg	
124-48-1	Dibromochloromethane	ND	0.28	0.046	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.28	0.030	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.28	0.043	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.28	0.049	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.28	0.12	mg/kg	
75-34-3	1,1-Dichloroethane	ND	0.28	0.038	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.28	0.046	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.28	0.059	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.28	0.064	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.28	0.059	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.28	0.060	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.71	0.047	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.71	0.080	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.71	0.038	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.28	0.032	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.28	0.037	mg/kg	
123-91-1	1,4-Dioxane	ND	3.6	2.8	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.71	0.051	mg/kg	
100-41-4	Ethylbenzene	ND	0.28	0.098	mg/kg	
87-68-3	Hexachlorobutadiene	ND	0.71	0.082	mg/kg	
591-78-6	2-Hexanone	ND	1.4	0.11	mg/kg	
98-82-8	Isopropylbenzene	0.307	0.71	0.024	mg/kg	J
99-87-6	p-Isopropyltoluene	0.162	0.71	0.025	mg/kg	J
1634-04-4	Methyl Tert Butyl Ether	ND	0.28	0.026	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.71	0.077	mg/kg	
74-95-3	Methylene bromide	ND	0.71	0.065	mg/kg	
75-09-2	Methylene chloride	ND	0.28	0.076	mg/kg	
91-20-3	Naphthalene	ND	0.71	0.056	mg/kg	
103-65-1	n-Propylbenzene	0.569	0.71	0.022	mg/kg	J
100-42-5	Styrene	ND	0.71	0.024	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.71	0.057	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.28	0.056	mg/kg	
127-18-4	Tetrachloroethene	ND	0.28	0.045	mg/kg	
108-88-3	Toluene	ND	0.71	0.029	mg/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	0.71	0.061	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.71	0.073	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.28	0.031	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.28	0.082	mg/kg	
79-01-6	Trichloroethene	ND	0.28	0.035	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.28	0.057	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.71	0.041	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	0.71	0.20	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	0.71	0.22	mg/kg	
108-05-4	Vinyl Acetate	ND	0.71	0.22	mg/kg	
75-01-4	Vinyl chloride	ND	0.28	0.13	mg/kg	
	m,p-Xylene	ND	0.28	0.062	mg/kg	
95-47-6	o-Xylene	ND	0.28	0.040	mg/kg	
1330-20-7	Xylene (total)	ND	0.28	0.031	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.1

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	99%		70-130%
2037-26-5	Toluene-D8	97%		70-130%
460-00-4	4-Bromofluorobenzene	109%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
589-53-7	Heptane, 4-methyl-	11.05	2.2	mg/kg	JN
1071-81-4	Hexane, 2,2,5,5-tetramethyl-	11.55	1.6	mg/kg	JN
6236-88-0	Cyclohexane, 1-ethyl-4-methyl-, trans-	13.50	2.5	mg/kg	JN
2051-30-1	Octane, 2,6-dimethyl-	13.95	3.4	mg/kg	JN
2847-72-5	Decane, 4-methyl-	15.17	2.1	mg/kg	JN
91-17-8	Naphthalene, decahydro-	16.15	4.3	mg/kg	JN
934-80-5	Benzene, 4-ethyl-1,2-dimethyl-	16.31	2.3	mg/kg	JN
527-84-4	Benzene, 1-methyl-2-(1-methylethyl)-	16.82	2.2	mg/kg	JN
767-99-7	Benzene, (1-methyl-1-propenyl)-, (Z)-	17.29	1.7	mg/kg	JN
17059-48-2	1H-Indene, 2,3-dihydro-1,6-dimethyl-	17.78	6.3	mg/kg	JN
6682-71-9	1H-Indene, 2,3-dihydro-4,7-dimethyl-	18.43	1.9	mg/kg	JN
2613-76-5	1H-Indene, 2,3-dihydro-1,1,3-trimethyl-	19.25	1.6	mg/kg	JN
	Total TIC, Volatile		32.1	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8270D SW846 3546	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75361.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314
Run #2							

	Initial Weight	Final Volume
Run #1	20.6 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.58	0.072	mg/kg	
95-57-8	2-Chlorophenol	ND	0.29	0.013	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.58	0.015	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.58	0.017	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.58	0.094	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.2	0.14	mg/kg	UJ
534-52-1	4,6-Dinitro-o-cresol	ND	0.58	0.072	mg/kg	UJ
95-48-7	2-Methylphenol	ND	0.58	0.023	mg/kg	
	3&4-Methylphenol	ND	0.58	0.028	mg/kg	
88-75-5	2-Nitrophenol	ND	0.58	0.015	mg/kg	
100-02-7	4-Nitrophenol	ND	1.2	0.11	mg/kg	
87-86-5	Pentachlorophenol	ND	0.58	0.041	mg/kg	
108-95-2	Phenol	ND	0.29	0.016	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.58	0.014	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.58	0.014	mg/kg	
62-53-3	Aniline	ND	0.58	0.029	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.29	0.015	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.29	0.012	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.58	0.029	mg/kg	UJ
91-58-7	2-Chloronaphthalene	ND	0.29	0.016	mg/kg	
106-47-8	4-Chloroaniline	ND	0.58	0.014	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.29	0.014	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.29	0.018	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.29	0.021	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.29	0.018	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.29	0.013	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.58	0.039	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.58	0.014	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.29	0.029	mg/kg	
132-64-9	Dibenzofuran	ND	0.12	0.016	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.29	0.031	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.29	0.0090	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8270D SW846 3546	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.29	0.014	mg/kg	
131-11-3	Dimethyl phthalate	ND	0.29	0.017	mg/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.29	0.011	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.29	0.018	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.58	0.14	mg/kg	u5
67-72-1	Hexachloroethane	ND	0.29	0.014	mg/kg	
78-59-1	Isophorone	ND	0.29	0.013	mg/kg	
88-74-4	2-Nitroaniline	ND	0.58	0.014	mg/kg	
99-09-2	3-Nitroaniline	ND	0.58	0.032	mg/kg	
100-01-6	4-Nitroaniline	ND	0.58	0.014	mg/kg	
98-95-3	Nitrobenzene	ND	0.29	0.016	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.29	0.014	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.29	0.017	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.29	0.017	mg/kg	
110-86-1	Pyridine	ND	0.58	0.029	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	60%		30-130%
4165-62-2	Phenol-d5	55%		30-130%
118-79-6	2,4,6-Tribromophenol	54%		30-130%
4165-60-0	Nitrobenzene-d5	58%		30-130%
321-60-8	2-Fluorobiphenyl	59%		30-130%
1718-51-0	Terphenyl-d14	52%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91225.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397
Run #2							

	Initial Weight	Final Volume
Run #1	20.6 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	0.238	0.0058	0.0010	mg/kg	
208-96-8	Acenaphthylene	0.0517	0.0058	0.00088	mg/kg	
120-12-7	Anthracene	0.189	0.0058	0.0013	mg/kg	
56-55-3	Benzo(a)anthracene	0.0230	0.0058	0.0027	mg/kg	
50-32-8	Benzo(a)pyrene	0.0036	0.0058	0.0023	mg/kg	J
205-99-2	Benzo(b)fluoranthene	0.0046	0.0058	0.0026	mg/kg	J
191-24-2	Benzo(g,h,i)perylene	ND	0.0058	0.0016	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.0058	0.0018	mg/kg	
218-01-9	Chrysene	0.0446	0.0058	0.0016	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0058	0.0017	mg/kg	
206-44-0	Fluoranthene	0.0589	0.0058	0.0017	mg/kg	
86-73-7	Fluorene	0.373	0.0058	0.0011	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0058	0.0014	mg/kg	
90-12-0	1-Methylnaphthalene	2.82	0.012	0.0013	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.012	0.0011	mg/kg	
85-01-8	Phenanthrene	1.56	0.0058	0.0012	mg/kg	
129-00-0	Pyrene	0.144	0.0058	0.0018	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	63%		30-130%
321-60-8	2-Fluorobiphenyl	53%		30-130%
1718-51-0	Terphenyl-d14	75%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	YZ91293.D	1	08/12/14	SZ	08/11/14	OP39346	GYZ7620
Run #2							

	Initial Weight	Final Volume
Run #1	30.8 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0029	0.00085	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0029	0.00071	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	116%		61-167%
460-00-4	Bromofluorobenzene (S)	122%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE43-080814 (30-32')		
Lab Sample ID:	MC32763-1	Date Sampled:	08/08/14
Matrix:	SO - Soil	Date Received:	08/09/14
Method:	SW846 8015	Percent Solids:	84.1
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	AB85339.D	1	08/12/14	AF	n/a	n/a	GAB4541
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.44 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	156	14	2.1	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	91%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080814 HCL		
Lab Sample ID:	MC32763-2	Date Sampled:	08/08/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	N89627.D	1	08/21/14	KD	n/a	n/a	MSN3320
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080814 HCL		
Lab Sample ID:	MC32763-2	Date Sampled:	08/08/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080814 HCL		
Lab Sample ID:	MC32763-2	Date Sampled:	08/08/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/09/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	86%		70-130%
2037-26-5	Toluene-D8	93%		70-130%
460-00-4	4-Bromofluorobenzene	88%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-080814 ST		
Lab Sample ID:	MC32763-3	Date Sampled:	08/08/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/09/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK40158.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
Run #2							

	Initial Volume	Final Volume
Run #1	35.2 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	88%		36-173%
460-00-4	Bromofluorobenzene (S)	89%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody

Shell Oil Products Chain Of Custody Record

URS

LAB (LOCATION)
☐ XENCO (________)
☐ CALSCIENCE (________)
☑ OTHER (Accutest Labs 495 Technology Ctr W, Marlborough, MA 01752 (508-481-6200))
☐ Lab Vendor # (________)
☐ SPL (________)
Lab Vendor #

Please Check Appropriate Box:
☑ ENV. SERVICES ☐ MOTIVA RETAIL ☐ SHELL RETAIL
☐ MOTIVA SD&CM ☐ CONSULTANT ☐ LUBES
☐ SHELL PIPELINE ☐ OTHER ________

Print Bill To Contact Name: Bob Billman

PO #

INCIDENT # (ENV SERVICES): 0 7 2 1 n n 4 0
☐ CHECK IF NO INCIDENT # APPLIES

SAP #: 3 4 0 0 6 1

DATE: 8/8/2014
PAGE: 1 of 1

URS CORPORATION

1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300; ST. LOUIS, MO 63110

Elizabeth Kunkel, Bob Billman

314-429-0100 | 314-429-0462 | bob.billman@urs.com; elizabeth.kunkel@urs.com

SITE ADDRESS: Street and City: 900 South Central Ave; ROXANA
State: IL

4th SL Extension Well Install / 21562073.19200

LAB USE ONLY: MC32763

TURNAROUND TIME (CALENDAR DAYS):
☑ STANDARD (10 DAY) ☐ 5 DAYS ☐ 3 DAYS ☐ 2 DAYS ☐ 24 HOURS ☐ RESULTS NEEDED ON WEEKEND

☐ LA - RWQCB REPORT FORMAT ☐ UST AGENCY:

DELIVERABLES: ☐ LEVEL 1 ☑ LEVEL 2 ☐ LEVEL 3 ☑ LEVEL 4 ☑ OTHER (SPECIFY) EDD

TEMPERATURE ON RECEIPT C° | Cooler #1 | Cooler #2 | Cooler #3

SPECIAL INSTRUCTIONS OR NOTES :
* Please include "J" values on Reports.
* Please provide sample receipt upon login.

☑ SHELL CONTRACT RATE APPLIES
☐ STATE REIMBURSEMENT RATE APPLIES
☐ EDD NOT NEEDED
☑ RECEIPT VERIFICATION REQUESTED
☐ PROVIDE EDD DISK

REQUESTED ANALYSIS

LAB USE ONLY	Field Sample Identification	SAMPLING DATE	SAMPLING TIME	MATRIX	PRESERVATIVE [illegible]	PRESERVATIVE [illegible]	PRESERVATIVE [illegible]	PRESERVATIVE NONE	PRESERVATIVE OTHER	NO. OF CONT.	VOC 8260B SL+TICS "Top 15"	VOC 8011 SL	SVOC 8270C SL+TICS	PAH 8270LL	Percent Moisture	TPH-GRO	PID (ppm)	FIELD NOTES: Container PID Readings or Laboratory Notes
1	SVE43-080814 (30-32) ✓	8/8/2014	1300	S				2	6	7	X	X	X	X	X	X	831	
2	TB-080814 HCL ✓			W	2					7	X							
3	TB-080814 ST ✓			W					7	7		X						

TEMPERATURE ON RECEIPT C°

8B, 10K4, 2A3

2.1°

Relinquished by (Signature)	Received by (Signature)	Date	Time
[signature]	FED EX	8/8/14	1730
FX	[signature]	8/9/14	10:00

MC32763: Chain of Custody
Page 1 of 2

5.1

5

P:\Projects\Environmental\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\4th Street Analytical\Data Review

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC32763 **Client:** URS **Immediate Client Services Action Required:** No

Date / Time Received: 8/9/2014 **Delivery Method:** **Client Service Action Required at Login:** No

Project: 900 SOUTH CENTRAL **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y or N		Y or N
1. Custody Seals Present:	☑ ☐	3. COC Present:	☑ ☐
2. Custody Seals Intact:	☑ ☐	4. Smpl Dates/Time OK	☑ ☐

Cooler Temperature	Y or N
1. Temp criteria achieved:	☑ ☐
2. Cooler temp verification:	Infared gun
3. Cooler media:	Ice (bag)

Quality Control Preservation	Y or N	N/A
1. Trip Blank present / cooler:	☑ ☐	☐
2. Trip Blank listed on COC:	☑ ☐	☐
3. Samples preserved properly:	☑ ☐	
4. VOCs headspace free:	☑ ☐	☐

Sample Integrity - Documentation	Y or N
1. Sample labels present on bottles:	☑ ☐
2. Container labeling complete:	☑ ☐
3. Sample container label / COC agree:	☑ ☐

Sample Integrity - Condition	Y or N
1. Sample recvd within HT:	☑ ☐
2. All containers accounted for:	☑ ☐
3. Condition of sample:	Intact

Sample Integrity - Instructions	Y or N	N/A
1. Analysis requested is clear:	☑ ☐	
2. Bottles received for unspecified tests	☐ ☑	
3. Sufficient volume recvd for analysis:	☑ ☐	
4. Compositing instructions clear:	☐ ☐	☑
5. Filtering instructions clear:	☐ ☐	☑

Comments

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC32763

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC32763-1 Collected: 08-AUG-14 13:00 By:			Received: 09-AUG-14 By:			
SVE43-080814 (30-32')						
MC32763-1	SW846 8011	12-AUG-14 00:31	SZ	11-AUG-14	AZ	V8011SL
MC32763-1	SW846 8015	12-AUG-14 15:17	AF			V8015GRO
MC32763-1	SM21 2540 B MOD.	13-AUG-14	CF			%SOL
MC32763-1	SW846 8270D	15-AUG-14 02:07	WK	11-AUG-14	AZ	AB8270SL+
MC32763-1	SW846 8270D BY SIM	15-AUG-14 22:19	WK	11-AUG-14	MT	B8270SIMSL
MC32763-1	SW846 8260C	20-AUG-14 18:19	JM			V8260SL+
MC32763-2 Collected: 08-AUG-14 00:00 By:			Received: 09-AUG-14 By:			
TB-080814 HCL						
MC32763-2	SW846 8260C	21-AUG-14 19:37	KD			V8260SL+
MC32763-3 Collected: 08-AUG-14 00:00 By:			Received: 09-AUG-14 By:			
TB-080814 ST						
MC32763-3	SW846 8011	19-AUG-14 19:08	AP	14-AUG-14	MT	V8011SL

Accutest Internal Chain of Custody

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/09/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC32763-1.1	Walk In Ref #5	Alireza Zeighami	08/11/14 07:36	Retrieve from Storage
MC32763-1.1	Alireza Zeighami	Walk In Ref #5	08/11/14 08:12	Return to Storage
MC32763-1.1	Walk In Ref #5	Alireza Zeighami	08/11/14 10:55	Retrieve from Storage
MC32763-1.1	Alireza Zeighami	Walk In Ref #5	08/11/14 14:25	Return to Storage
MC32763-1.1	Walk In Ref #5	Crystall Woodruff	08/13/14 17:00	Retrieve from Storage
MC32763-1.1	Crystall Woodruff	Walk In Ref #5	08/13/14 18:36	Return to Storage
MC32763-1.5	VOC Ref #10	Jaime Maslowski	08/20/14 09:45	Retrieve from Storage
MC32763-1.5	Jaime Maslowski	VOC Ref #10	08/21/14 09:06	Return to Storage
MC32763-1.6	VOC Ref #10	Anthony Franciosa	08/12/14 07:47	Retrieve from Storage
MC32763-1.6	Anthony Franciosa	GCAB	08/12/14 07:47	Load on Instrument
MC32763-1.6	GCAB	Anthony Franciosa	08/12/14 10:05	Unload from Instrument
MC32763-1.6	Anthony Franciosa	VOC Ref #10	08/12/14 10:05	Return to Storage
MC32763-2.1	VOC Ref #2	Amy Min Yang	08/21/14 17:47	Retrieve from Storage
MC32763-2.1	Amy Min Yang	GCMSN	08/21/14 17:47	Load on Instrument
MC32763-2.1	GCMSN	Jaclyn Bergeron	08/22/14 09:58	Unload from Instrument
MC32763-2.1	Jaclyn Bergeron	VOC Ref #2	08/22/14 09:58	Return to Storage
MC32763-3.1	VOC Ref #2	Marc Tahtamoni	08/14/14 20:19	Retrieve from Storage

5.3

New England ACCUTEST LABORATORIES

GC/MS Volatiles

6

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-MB	K81265.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	500	140	ug/kg	
107-02-8	Acrolein	ND	1300	440	ug/kg	
107-13-1	Acrylonitrile	ND	1300	140	ug/kg	
71-43-2	Benzene	ND	25	17	ug/kg	
108-86-1	Bromobenzene	ND	250	13	ug/kg	
74-97-5	Bromochloromethane	ND	250	17	ug/kg	
75-27-4	Bromodichloromethane	ND	100	10	ug/kg	
75-25-2	Bromoform	ND	100	18	ug/kg	
74-83-9	Bromomethane	ND	100	30	ug/kg	
78-93-3	2-Butanone (MEK)	ND	500	150	ug/kg	
104-51-8	n-Butylbenzene	ND	250	12	ug/kg	
135-98-8	sec-Butylbenzene	ND	250	37	ug/kg	
98-06-6	tert-Butylbenzene	ND	250	11	ug/kg	
75-15-0	Carbon disulfide	ND	250	6.5	ug/kg	
56-23-5	Carbon tetrachloride	ND	100	11	ug/kg	
108-90-7	Chlorobenzene	ND	100	7.9	ug/kg	
75-00-3	Chloroethane	ND	250	38	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	250	63	ug/kg	
67-66-3	Chloroform	ND	100	8.5	ug/kg	
74-87-3	Chloromethane	ND	250	28	ug/kg	
95-49-8	o-Chlorotoluene	ND	250	9.6	ug/kg	
106-43-4	p-Chlorotoluene	ND	250	13	ug/kg	
124-48-1	Dibromochloromethane	ND	100	16	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	100	11	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	100	15	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	100	17	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	100	40	ug/kg	
75-34-3	1,1-Dichloroethane	ND	100	13	ug/kg	
107-06-2	1,2-Dichloroethane	ND	100	16	ug/kg	
75-35-4	1,1-Dichloroethene	ND	100	21	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	100	23	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	100	21	ug/kg	
78-87-5	1,2-Dichloropropane	ND	100	21	ug/kg	
142-28-9	1,3-Dichloropropane	ND	250	16	ug/kg	
594-20-7	2,2-Dichloropropane	ND	250	28	ug/kg	
563-58-6	1,1-Dichloropropene	ND	250	13	ug/kg	

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-MB	K81265.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	100	11	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	100	13	ug/kg	
123-91-1	1,4-Dioxane	ND	1300	1000	ug/kg	
97-63-2	Ethyl methacrylate	ND	250	18	ug/kg	
100-41-4	Ethylbenzene	ND	100	34	ug/kg	
87-68-3	Hexachlorobutadiene	ND	250	29	ug/kg	
591-78-6	2-Hexanone	ND	500	38	ug/kg	
98-82-8	Isopropylbenzene	ND	250	8.4	ug/kg	
99-87-6	p-Isopropyltoluene	ND	250	8.7	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	100	9.1	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	250	27	ug/kg	
74-95-3	Methylene bromide	ND	250	23	ug/kg	
75-09-2	Methylene chloride	ND	100	27	ug/kg	
91-20-3	Naphthalene	ND	250	20	ug/kg	
103-65-1	n-Propylbenzene	ND	250	7.6	ug/kg	
100-42-5	Styrene	ND	250	8.5	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	250	20	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	100	20	ug/kg	
127-18-4	Tetrachloroethene	ND	100	16	ug/kg	
108-88-3	Toluene	ND	250	10	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	250	21	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	250	26	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	100	11	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	100	29	ug/kg	
79-01-6	Trichloroethene	ND	100	12	ug/kg	
75-69-4	Trichlorofluoromethane	ND	100	20	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	250	14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	250	72	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	250	76	ug/kg	
108-05-4	Vinyl Acetate	ND	250	77	ug/kg	
75-01-4	Vinyl chloride	ND	100	45	ug/kg	
	m,p-Xylene	ND	100	22	ug/kg	
95-47-6	o-Xylene	ND	100	14	ug/kg	
1330-20-7	Xylene (total)	ND	100	11	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-MB	K81265.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	100%	70-130%
2037-26-5	Toluene-D8	104%	70-130%
460-00-4	4-Bromofluorobenzene	96%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-MB	N89625.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

6.1.2

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-MB	N89625.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	0.40	0.40	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

6.1.2

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-MB	N89625.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	86%	70-130%
2037-26-5	Toluene-D8	92%	70-130%
460-00-4	4-Bromofluorobenzene	87%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

6.1.2

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-BS	K81263.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
67-64-1	Acetone	2500	3050	122	70-130
107-02-8	Acrolein	12500	13300	106	70-130
107-13-1	Acrylonitrile	2500	2380	95	70-130
71-43-2	Benzene	2500	2300	92	70-130
108-86-1	Bromobenzene	2500	2620	105	70-130
74-97-5	Bromochloromethane	2500	2520	101	70-130
75-27-4	Bromodichloromethane	2500	2570	103	70-130
75-25-2	Bromoform	2500	2390	96	70-130
74-83-9	Bromomethane	2500	2550	102	70-130
78-93-3	2-Butanone (MEK)	2500	2890	116	70-130
104-51-8	n-Butylbenzene	2500	2830	113	70-130
135-98-8	sec-Butylbenzene	2500	2950	118	70-130
98-06-6	tert-Butylbenzene	2500	2810	112	70-130
75-15-0	Carbon disulfide	2500	2820	113	70-130
56-23-5	Carbon tetrachloride	2500	2890	116	70-130
108-90-7	Chlorobenzene	2500	2470	99	70-130
75-00-3	Chloroethane	2500	2950	118	70-130
110-75-8	2-Chloroethyl vinyl ether	2500	2470	99	10-160
67-66-3	Chloroform	2500	2400	96	70-130
74-87-3	Chloromethane	2500	2720	109	70-130
95-49-8	o-Chlorotoluene	2500	2620	105	70-130
106-43-4	p-Chlorotoluene	2500	2510	100	70-130
124-48-1	Dibromochloromethane	2500	2400	96	70-130
95-50-1	1,2-Dichlorobenzene	2500	2550	102	70-130
541-73-1	1,3-Dichlorobenzene	2500	2520	101	70-130
106-46-7	1,4-Dichlorobenzene	2500	2560	102	70-130
75-71-8	Dichlorodifluoromethane	2500	2790	112	70-130
75-34-3	1,1-Dichloroethane	2500	2580	103	70-130
107-06-2	1,2-Dichloroethane	2500	2460	98	70-130
75-35-4	1,1-Dichloroethene	2500	3110	124	70-130
156-59-2	cis-1,2-Dichloroethene	2500	2350	94	70-130
156-60-5	trans-1,2-Dichloroethene	2500	2530	101	70-130
78-87-5	1,2-Dichloropropane	2500	2540	102	70-130
142-28-9	1,3-Dichloropropane	2500	2340	94	70-130
594-20-7	2,2-Dichloropropane	2500	2820	113	70-130
563-58-6	1,1-Dichloropropene	2500	2580	103	70-130

* = Outside of Control Limits.

6.2.1

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-BS	K81263.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	2500	2540	102	70-130
10061-02-6	trans-1,3-Dichloropropene	2500	2690	108	70-130
123-91-1	1,4-Dioxane	6250	6000	96	70-130
97-63-2	Ethyl methacrylate	2500	2390	96	76-141
100-41-4	Ethylbenzene	2500	2490	100	70-130
87-68-3	Hexachlorobutadiene	2500	2860	114	70-130
591-78-6	2-Hexanone	2500	2320	93	70-130
98-82-8	Isopropylbenzene	2500	2890	116	70-130
99-87-6	p-Isopropyltoluene	2500	2810	112	70-130
1634-04-4	Methyl Tert Butyl Ether	2500	2510	100	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	2500	2240	90	70-130
74-95-3	Methylene bromide	2500	2580	103	70-130
75-09-2	Methylene chloride	2500	2670	107	70-130
91-20-3	Naphthalene	2500	2450	98	70-130
103-65-1	n-Propylbenzene	2500	2770	111	70-130
100-42-5	Styrene	2500	2410	96	70-130
630-20-6	1,1,1,2-Tetrachloroethane	2500	2450	98	70-130
79-34-5	1,1,2,2-Tetrachloroethane	2500	2510	100	70-130
127-18-4	Tetrachloroethene	2500	2480	99	70-130
108-88-3	Toluene	2500	2540	102	70-130
87-61-6	1,2,3-Trichlorobenzene	2500	2510	100	70-130
120-82-1	1,2,4-Trichlorobenzene	2500	2540	102	70-130
71-55-6	1,1,1-Trichloroethane	2500	2700	108	70-130
79-00-5	1,1,2-Trichloroethane	2500	2380	95	70-130
79-01-6	Trichloroethene	2500	2500	100	70-130
75-69-4	Trichlorofluoromethane	2500	3060	122	70-130
96-18-4	1,2,3-Trichloropropane	2500	2390	96	70-130
95-63-6	1,2,4-Trimethylbenzene	2500	2680	107	70-130
108-67-8	1,3,5-Trimethylbenzene	2500	2650	106	70-130
108-05-4	Vinyl Acetate	2500	1790	72	70-130
75-01-4	Vinyl chloride	2500	2750	110	70-130
	m,p-Xylene	5000	4800	96	70-130
95-47-6	o-Xylene	2500	2420	97	70-130
1330-20-7	Xylene (total)	7500	7220	96	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSK2572-BS	K81263.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	98%	70-130%
2037-26-5	Toluene-D8	101%	70-130%
460-00-4	4-Bromofluorobenzene	98%	70-130%

6.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-BS	N89623.D	1	08/21/14	KD	n/a	n/a	MSN3320

6.2.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
67-64-1	Acetone	50	43.1	86	70-130
107-02-8	Acrolein	250	161	64* a	70-130
107-13-1	Acrylonitrile	50	49.0	98	70-130
71-43-2	Benzene	50	46.6	93	70-130
108-86-1	Bromobenzene	50	45.2	90	70-130
74-97-5	Bromochloromethane	50	47.6	95	70-130
75-27-4	Bromodichloromethane	50	49.9	100	70-130
75-25-2	Bromoform	50	48.5	97	70-130
74-83-9	Bromomethane	50	34.4	69* a	70-130
78-93-3	2-Butanone (MEK)	50	46.2	92	70-130
104-51-8	n-Butylbenzene	50	51.3	103	70-130
135-98-8	sec-Butylbenzene	50	45.8	92	70-130
98-06-6	tert-Butylbenzene	50	44.3	89	70-130
75-15-0	Carbon disulfide	50	48.6	97	70-130
56-23-5	Carbon tetrachloride	50	49.0	98	70-130
108-90-7	Chlorobenzene	50	46.1	92	70-130
75-00-3	Chloroethane	50	48.8	98	70-130
110-75-8	2-Chloroethyl vinyl ether	50	48.6	97	70-130
67-66-3	Chloroform	50	44.1	88	70-130
74-87-3	Chloromethane	50	40.5	81	70-130
95-49-8	o-Chlorotoluene	50	44.5	89	70-130
106-43-4	p-Chlorotoluene	50	45.0	90	70-130
124-48-1	Dibromochloromethane	50	50.7	101	70-130
95-50-1	1,2-Dichlorobenzene	50	49.0	98	70-130
541-73-1	1,3-Dichlorobenzene	50	46.9	94	70-130
106-46-7	1,4-Dichlorobenzene	50	46.5	93	70-130
75-71-8	Dichlorodifluoromethane	50	32.6	65* a	70-130
75-34-3	1,1-Dichloroethane	50	48.0	96	70-130
107-06-2	1,2-Dichloroethane	50	43.5	87	70-130
75-35-4	1,1-Dichloroethene	50	48.6	97	70-130
156-59-2	cis-1,2-Dichloroethene	50	44.8	90	70-130
156-60-5	trans-1,2-Dichloroethene	50	46.2	92	70-130
78-87-5	1,2-Dichloropropane	50	49.5	99	70-130
142-28-9	1,3-Dichloropropane	50	45.7	91	70-130
594-20-7	2,2-Dichloropropane	50	53.8	108	70-130
563-58-6	1,1-Dichloropropene	50	43.5	87	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-BS	N89623.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
10061-01-5	cis-1,3-Dichloropropene	50	48.0	96	70-130
10061-02-6	trans-1,3-Dichloropropene	50	55.2	110	70-130
123-91-1	1,4-Dioxane	125	141	113	70-130
97-63-2	Ethyl methacrylate	50	52.2	104	77-137
100-41-4	Ethylbenzene	50	45.7	91	70-130
87-68-3	Hexachlorobutadiene	50	51.1	102	70-130
591-78-6	2-Hexanone	50	37.2	74	70-130
98-82-8	Isopropylbenzene	50	46.3	93	70-130
99-87-6	p-Isopropyltoluene	50	47.1	94	70-130
1634-04-4	Methyl Tert Butyl Ether	50	50.0	100	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	50	44.8	90	70-130
74-95-3	Methylene bromide	50	47.3	95	70-130
75-09-2	Methylene chloride	50	44.2	88	70-130
91-20-3	Naphthalene	50	61.1	122	70-130
103-65-1	n-Propylbenzene	50	46.3	93	70-130
100-42-5	Styrene	50	48.2	96	70-130
630-20-6	1,1,1,2-Tetrachloroethane	50	45.5	91	70-130
79-34-5	1,1,2,2-Tetrachloroethane	50	46.7	93	70-130
127-18-4	Tetrachloroethene	50	46.4	93	70-130
108-88-3	Toluene	50	48.1	96	70-130
87-61-6	1,2,3-Trichlorobenzene	50	58.8	118	70-130
120-82-1	1,2,4-Trichlorobenzene	50	52.4	105	70-130
71-55-6	1,1,1-Trichloroethane	50	44.8	90	70-130
79-00-5	1,1,2-Trichloroethane	50	48.2	96	70-130
79-01-6	Trichloroethene	50	39.3	79	70-130
75-69-4	Trichlorofluoromethane	50	34.9	70	70-130
96-18-4	1,2,3-Trichloropropane	50	46.7	93	70-130
95-63-6	1,2,4-Trimethylbenzene	50	46.2	92	70-130
108-67-8	1,3,5-Trimethylbenzene	50	43.3	87	70-130
108-05-4	Vinyl Acetate	50	44.0	88	70-130
75-01-4	Vinyl chloride	50	35.1	70	70-130
	m,p-Xylene	100	91.9	92	70-130
95-47-6	o-Xylene	50	45.6	91	70-130
1330-20-7	Xylene (total)	150	137	91	70-130

* = Outside of Control Limits.

6.2.2

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3320-BS	N89623.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	88%	70-130%
2037-26-5	Toluene-D8	93%	70-130%
460-00-4	4-Bromofluorobenzene	83%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

6.2.2 B

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32899-1MS	K81280.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1MSD	K81281.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1	K81273.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	MC32899-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		2830	3260	115	2830	3420	121	5	70-130/30
107-02-8	Acrolein	ND		14200	12500	88	14200	12600	89	1	70-130/30
107-13-1	Acrylonitrile	ND		2830	2680	95	2830	2810	99	5	70-130/30
71-43-2	Benzene	ND		2830	2600	92	2830	2570	91	1	70-130/30
108-86-1	Bromobenzene	ND		2830	2910	103	2830	2940	104	1	70-130/30
74-97-5	Bromochloromethane	ND		2830	2760	98	2830	2730	96	1	70-130/30
75-27-4	Bromodichloromethane	ND		2830	2950	104	2830	2930	104	1	70-130/30
75-25-2	Bromoform	ND		2830	2590	92	2830	2740	97	6	70-130/30
74-83-9	Bromomethane	ND		2830	2880	102	2830	2840	100	1	70-130/30
78-93-3	2-Butanone (MEK)	ND		2830	3150	111	2830	3150	111	0	70-130/30
104-51-8	n-Butylbenzene	ND		2830	3120	110	2830	3190	113	2	70-130/30
135-98-8	sec-Butylbenzene	ND		2830	3140	111	2830	3210	113	2	70-130/30
98-06-6	tert-Butylbenzene	ND		2830	3130	111	2830	3170	112	1	70-130/30
75-15-0	Carbon disulfide	ND		2830	3070	108	2830	2850	101	7	70-130/30
56-23-5	Carbon tetrachloride	ND		2830	3200	113	2830	3130	111	2	70-130/30
108-90-7	Chlorobenzene	ND		2830	2660	94	2830	2750	97	3	70-130/30
75-00-3	Chloroethane	ND		2830	3380	119	2830	3230	114	5	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		2830	2800	99	2830	2860	101	2	10-160/30
67-66-3	Chloroform	ND		2830	2720	96	2830	2610	92	4	70-130/30
74-87-3	Chloromethane	ND		2830	2980	105	2830	2860	101	4	70-130/30
95-49-8	o-Chlorotoluene	ND		2830	2940	104	2830	2950	104	0	70-130/30
106-43-4	p-Chlorotoluene	ND		2830	2850	101	2830	2900	102	2	70-130/30
124-48-1	Dibromochloromethane	ND		2830	2690	95	2830	2740	97	2	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		2830	2770	98	2830	2920	103	5	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		2830	2790	99	2830	2920	103	5	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		2830	2830	100	2830	2920	103	3	70-130/30
75-71-8	Dichlorodifluoromethane	ND		2830	2770	98	2830	2820	100	2	70-130/30
75-34-3	1,1-Dichloroethane	ND		2830	2940	104	2830	2840	100	3	70-130/30
107-06-2	1,2-Dichloroethane	ND		2830	2690	95	2830	2830	100	5	70-130/30
75-35-4	1,1-Dichloroethene	ND		2830	3220	114	2830	3080	109	4	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		2830	2650	94	2830	2600	92	2	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		2830	2790	99	2830	2620	93	6	70-130/30
78-87-5	1,2-Dichloropropane	ND		2830	2760	98	2830	2840	100	3	70-130/30
142-28-9	1,3-Dichloropropane	ND		2830	2580	91	2830	2680	95	4	70-130/30
594-20-7	2,2-Dichloropropane	ND		2830	2820	100	2830	2700	95	4	70-130/30
563-58-6	1,1-Dichloropropene	ND		2830	2890	102	2830	2880	102	0	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32899-1MS	K81280.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1MSD	K81281.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1	K81273.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Compound	MC32899-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		2830	2770	98	2830	2680	95	3	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		2830	2920	103	2830	2980	105	2	70-130/30
123-91-1	1,4-Dioxane	ND		7080	2800	40* [a]	7080	2790	39* [a]	0	70-130/30
97-63-2	Ethyl methacrylate	ND		2830	2830	100	2830	2950	104	4	41-160/30
100-41-4	Ethylbenzene	ND		2830	2740	97	2830	2760	98	1	70-130/30
87-68-3	Hexachlorobutadiene	ND		2830	2840	100	2830	2900	102	2	70-130/30
591-78-6	2-Hexanone	ND		2830	2790	99	2830	2980	105	7	70-130/30
98-82-8	Isopropylbenzene	ND		2830	3170	112	2830	3280	116	3	70-130/30
99-87-6	p-Isopropyltoluene	ND		2830	3040	107	2830	3060	108	1	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		2830	2670	94	2830	2640	93	1	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		2830	2720	96	2830	2810	99	3	70-130/30
74-95-3	Methylene bromide	ND		2830	2780	98	2830	2850	101	2	70-130/30
75-09-2	Methylene chloride	ND		2830	2820	100	2830	2760	98	2	70-130/30
91-20-3	Naphthalene	ND		2830	2510	89	2830	2630	93	5	70-130/30
103-65-1	n-Propylbenzene	ND		2830	3140	111	2830	3170	112	1	70-130/30
100-42-5	Styrene	ND		2830	2650	94	2830	2740	97	3	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		2830	2630	93	2830	2700	95	3	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		2830	2690	95	2830	2780	98	3	70-130/30
127-18-4	Tetrachloroethene	ND		2830	2720	96	2830	2710	96	0	70-130/30
108-88-3	Toluene	ND		2830	2830	100	2830	2830	100	0	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		2830	2460	87	2830	2680	95	9	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		2830	2720	96	2830	2850	101	5	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		2830	2950	104	2830	2950	104	0	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		2830	2740	97	2830	2810	99	3	70-130/30
79-01-6	Trichloroethene	ND		2830	2840	100	2830	2880	102	1	70-130/30
75-69-4	Trichlorofluoromethane	ND		2830	3210	113	2830	3160	112	2	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		2830	2680	95	2830	2750	97	3	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		2830	2960	105	2830	3080	109	4	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		2830	2910	103	2830	2960	105	2	70-130/30
108-05-4	Vinyl Acetate	ND		2830	1590	56* [a]	2830	1510	53* [a]	5	70-130/30
75-01-4	Vinyl chloride	ND		2830	2730	96	2830	2750	97	1	70-130/30
	m,p-Xylene	ND		5660	5370	95	5660	5560	98	3	70-130/30
95-47-6	o-Xylene	ND		2830	2550	90	2830	2700	95	6	70-130/30
1330-20-7	Xylene (total)	ND		8490	7920	93	8490	8250	97	4	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32899-1MS	K81280.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1MSD	K81281.D	1	08/20/14	JM	n/a	n/a	MSK2572
MC32899-1	K81273.D	1	08/20/14	JM	n/a	n/a	MSK2572

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-1

CAS No.	Surrogate Recoveries	MS	MSD	MC32899-1	Limits
1868-53-7	Dibromofluoromethane	96%	94%	95%	70-130%
2037-26-5	Toluene-D8	98%	97%	90%	70-130%
460-00-4	4-Bromofluorobenzene	95%	97%	96%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32987-1MS	N89632.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1MSD	N89633.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1	N89629.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	MC32987-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		250	100	40* [a]	250	88.6	35* [a]	12	70-130/30
107-02-8	Acrolein	ND		1250	720	58* [a]	1250	664	53* [a]	8	70-130/30
107-13-1	Acrylonitrile	ND		250	256	102	250	228	91	12	70-130/30
71-43-2	Benzene	0.41	J	250	249	99	250	238	95	5	70-130/30
108-86-1	Bromobenzene	ND		250	236	94	250	234	94	1	70-130/30
74-97-5	Bromochloromethane	ND		250	257	103	250	250	100	3	70-130/30
75-27-4	Bromodichloromethane	ND		250	272	109	250	255	102	6	70-130/30
75-25-2	Bromoform	ND		250	247	99	250	229	92	8	70-130/30
74-83-9	Bromomethane	ND		250	201	80	250	188	75	7	70-130/30
78-93-3	2-Butanone (MEK)	ND		250	160	64* [a]	250	150	60* [a]	6	70-130/30
104-51-8	n-Butylbenzene	ND		250	279	112	250	265	106	5	70-130/30
135-98-8	sec-Butylbenzene	ND		250	250	100	250	241	96	4	70-130/30
98-06-6	tert-Butylbenzene	ND		250	246	98	250	237	95	4	70-130/30
75-15-0	Carbon disulfide	ND		250	277	111	250	265	106	4	70-130/30
56-23-5	Carbon tetrachloride	ND		250	294	118	250	274	110	7	70-130/30
108-90-7	Chlorobenzene	ND		250	245	98	250	234	94	5	70-130/30
75-00-3	Chloroethane	ND		250	252	101	250	239	96	5	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		250	257	103	250	247	99	4	70-130/30
67-66-3	Chloroform	ND		250	246	98	250	235	94	5	70-130/30
74-87-3	Chloromethane	4.4		250	221	87	250	213	83	4	70-130/30
95-49-8	o-Chlorotoluene	ND		250	240	96	250	234	94	3	70-130/30
106-43-4	p-Chlorotoluene	ND		250	240	96	250	232	93	3	70-130/30
124-48-1	Dibromochloromethane	ND		250	265	106	250	250	100	6	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		250	255	102	250	249	100	2	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		250	243	97	250	236	94	3	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		250	239	96	250	229	92	4	70-130/30
75-71-8	Dichlorodifluoromethane	ND		250	217	87	250	194	78	11	70-130/30
75-34-3	1,1-Dichloroethane	ND		250	270	108	250	258	103	5	70-130/30
107-06-2	1,2-Dichloroethane	ND		250	242	97	250	224	90	8	70-130/30
75-35-4	1,1-Dichloroethene	ND		250	271	108	250	266	106	2	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		250	246	98	250	236	94	4	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		250	254	102	250	244	98	4	70-130/30
78-87-5	1,2-Dichloropropane	ND		250	262	105	250	251	100	4	70-130/30
142-28-9	1,3-Dichloropropane	ND		250	234	94	250	224	90	4	70-130/30
594-20-7	2,2-Dichloropropane	ND		250	294	118	250	271	108	8	70-130/30
563-58-6	1,1-Dichloropropene	ND		250	242	97	250	229	92	6	70-130/30

* = Outside of Control Limits.

6.3.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32987-1MS	N89632.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1MSD	N89633.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1	N89629.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Compound	MC32987-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		250	252	101	250	238	95	6	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		250	288	115	250	269	108	7	70-130/30
123-91-1	1,4-Dioxane	ND		625	692	111	625	580	93	18	70-130/30
97-63-2	Ethyl methacrylate	ND		250	254	102	250	233	93	9	72-139/30
100-41-4	Ethylbenzene	ND		250	252	101	250	242	97	4	70-130/30
87-68-3	Hexachlorobutadiene	ND		250	277	111	250	263	105	5	70-130/30
591-78-6	2-Hexanone	ND		250	137	55* [a]	250	118	47* [a]	15	70-130/30
98-82-8	Isopropylbenzene	ND		250	248	99	250	241	96	3	70-130/30
99-87-6	p-Isopropyltoluene	ND		250	256	102	250	246	98	4	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		250	250	100	250	226	90	10	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		250	230	92	250	195	78	16	70-130/30
74-95-3	Methylene bromide	ND		250	247	99	250	228	91	8	70-130/30
75-09-2	Methylene chloride	ND		250	237	95	250	228	91	4	70-130/30
91-20-3	Naphthalene	ND		250	270	108	250	243	97	11	70-130/30
103-65-1	n-Propylbenzene	ND		250	251	100	250	243	97	3	70-130/30
100-42-5	Styrene	ND		250	258	103	250	248	99	4	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		250	244	98	250	235	94	4	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		250	231	92	250	213	85	8	70-130/30
127-18-4	Tetrachloroethene	ND		250	253	101	250	241	96	5	70-130/30
108-88-3	Toluene	ND		250	255	102	250	244	98	4	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		250	284	114	250	267	107	6	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		250	260	104	250	249	100	4	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		250	262	105	250	248	99	5	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		250	248	99	250	230	92	8	70-130/30
79-01-6	Trichloroethene	ND		250	224	90	250	214	86	5	70-130/30
75-69-4	Trichlorofluoromethane	ND		250	220	88	250	201	80	9	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		250	243	97	250	218	87	11	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		250	243	97	250	237	95	3	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		250	230	92	250	226	90	2	70-130/30
108-05-4	Vinyl Acetate	ND		250	246	98	250	221	88	11	70-130/30
75-01-4	Vinyl chloride	ND		250	190	76	250	189	76	1	70-130/30
	m,p-Xylene	ND		500	497	99	500	471	94	5	70-130/30
95-47-6	o-Xylene	ND		250	248	99	250	238	95	4	70-130/30
1330-20-7	Xylene (total)	ND		750	745	99	750	709	95	5	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32987-1MS	N89632.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1MSD	N89633.D	5	08/21/14	KD	n/a	n/a	MSN3320
MC32987-1	N89629.D	1	08/21/14	KD	n/a	n/a	MSN3320

The QC reported here applies to the following samples: Method: SW846 8260C

MC32763-2

CAS No.	Surrogate Recoveries	MS	MSD	MC32987-1	Limits
1868-53-7	Dibromofluoromethane	88%	89%	88%	70-130%
2037-26-5	Toluene-D8	94%	93%	91%	70-130%
460-00-4	4-Bromofluorobenzene	82%	82%	88%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

Volatile Internal Standard Area Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSK2572-CC2552	Injection Date:	08/20/14
Lab File ID:	K81262.D	Injection Time:	08:38
Instrument ID:	GCMSK	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	103584	8.78	131183	9.63	57566	12.88	76225	15.44	52309	6.42
Upper Limit [a]	207168	9.28	262366	10.13	115132	13.38	152450	15.94	104618	6.92
Lower Limit [b]	51792	8.28	65592	9.13	28783	12.38	38113	14.94	26155	5.92
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSK2572-BS	101933	8.78	132971	9.63	57259	12.89	76098	15.44	55177	6.41
MSK2572-MB	113844	8.78	142997	9.63	58500	12.89	89195	15.44	59067	6.43
ZZZZZZ	107321	8.78	142512	9.63	55217	12.89	79846	15.44	58716	6.42
ZZZZZZ	110196	8.78	140270	9.63	54858	12.89	78203	15.44	55786	6.41
ZZZZZZ	111756	8.78	148476	9.63	59205	12.89	85114	15.44	55941	6.42
ZZZZZZ	110960	8.78	145940	9.63	53167	12.89	79560	15.44	57983	6.42
ZZZZZZ	111184	8.78	145417	9.63	56326	12.89	82805	15.44	58714	6.42
ZZZZZZ	123156	8.79	160387	9.63	62926	12.89	89519	15.44	69266	6.44
ZZZZZZ	115221	8.78	149321	9.63	59527	12.89	83837	15.44	58503	6.42
MC32899-1	113527	8.78	150286	9.63	58267	12.89	83920	15.44	57852	6.42
ZZZZZZ	113305	8.78	149967	9.63	58742	12.89	86963	15.44	57975	6.42
ZZZZZZ	114952	8.78	148735	9.63	55966	12.89	82592	15.44	57834	6.42
ZZZZZZ	115639	8.78	151552	9.63	58930	12.89	87775	15.44	59695	6.42
ZZZZZZ	117397	8.78	151513	9.63	57476	12.89	84441	15.44	58387	6.42
ZZZZZZ	111039	8.79	146546	9.63	56852	12.89	89346	15.44	60431	6.44
ZZZZZZ	116418	8.79	146323	9.63	58554	12.89	88816	15.44	47572	6.42
MC32899-1MS	105177	8.78	139675	9.63	62173	12.89	80945	15.44	51841	6.43
MC32899-1MSD	105850	8.78	138153	9.63	60545	12.89	80127	15.44	52847	6.42
ZZZZZZ	110061	8.78	143882	9.63	56949	12.89	82288	15.44	53433	6.43
MC32763-1	108980	8.78	140567	9.63	53844	12.89	84187	15.44	54349	6.42
ZZZZZZ	110208	8.78	144152	9.63	55964	12.89	79969	15.44	55291	6.41
ZZZZZZ	104375	8.78	140916	9.63	60068	12.89	87299	15.44	61522	6.43
ZZZZZZ	118895	8.78	156709	9.63	64339	12.89	91452	15.44	67374	6.43

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.4.1

Volatile Internal Standard Area Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSN3320-CC3314	Injection Date:	08/21/14
Lab File ID:	N89623.D	Injection Time:	17:44
Instrument ID:	GCMSN	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	318713	9.12	482146	9.99	273951	13.24	214637	15.80	137189	6.70
Upper Limit [a]	637426	9.62	964292	10.49	547902	13.74	429274	16.30	274378	7.20
Lower Limit [b]	159357	8.62	241073	9.49	136976	12.74	107319	15.30	68595	6.20
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSN3320-BS	318713	9.12	482146	9.99	273951	13.24	214637	15.80	137189	6.70
MSN3320-MB	283773	9.12	421941	9.99	227913	13.24	166738	15.80	96938	6.72
ZZZZZZ	272825	9.12	403423	9.99	221283	13.24	162522	15.80	121758	6.72
MC32763-2	259567	9.12	383372	9.99	207501	13.24	155031	15.80	102887	6.72
ZZZZZZ	253085	9.12	383796	9.99	206441	13.24	148799	15.80	91592	6.72
MC32987-1	251397	9.12	383899	9.99	208380	13.24	152901	15.80	110546	6.72
ZZZZZZ	245293	9.12	377801	9.99	203878	13.24	150802	15.80	96639	6.71
ZZZZZZ	249395	9.12	375609	9.99	206999	13.24	149275	15.80	87866	6.71
MC32987-1MS	259511	9.12	400659	9.99	230550	13.24	185375	15.80	105989	6.69
MC32987-1MSD	282785	9.12	437456	9.99	247672	13.24	195179	15.80	108845	6.69
ZZZZZZ	270135	9.12	410387	9.99	221738	13.25	166226	15.80	119100	6.71
ZZZZZZ	260517	9.12	391536	9.99	210239	13.24	156294	15.80	97614	6.72
ZZZZZZ	251112	9.12	389978	9.99	211477	13.25	153760	15.80	96079	6.72
ZZZZZZ	247421	9.12	375398	9.99	209080	13.24	152737	15.80	94227	6.71
ZZZZZZ	246067	9.12	369276	9.99	205945	13.24	150005	15.80	94332	6.71
ZZZZZZ	243967	9.12	379751	9.99	207831	13.24	152510	15.80	92660	6.72
ZZZZZZ	241435	9.12	371758	9.99	203885	13.24	149476	15.80	105687	6.71
ZZZZZZ	248339	9.12	373670	9.99	205818	13.24	150964	15.80	94312	6.72
ZZZZZZ	239353	9.12	373750	9.99	202023	13.24	159779	15.80	89987	6.72
ZZZZZZ	255743	9.12	417427	9.99	278702	13.25	249549	15.80	101070	6.70

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.4.2

Volatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32763-2	N89627.D	86	93	88
MC32987-1MS	N89632.D	88	94	82
MC32987-1MSD	N89633.D	89	93	82
MSN3320-BS	N89623.D	88	93	83
MSN3320-MB	N89625.D	86	92	87

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32763-1	K81283.D	99	97	109
MC32899-1MS	K81280.D	96	98	95
MC32899-1MSD	K81281.D	94	97	97
MSK2572-BS	K81263.D	98	101	98
MSK2572-MB	K81265.D	100	104	96

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

9.5.2

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-MB	F75357.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	480	60	ug/kg	
95-57-8	2-Chlorophenol	ND	240	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	480	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	480	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	480	79	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	960	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	480	60	ug/kg	
95-48-7	2-Methylphenol	ND	480	19	ug/kg	
	3&4-Methylphenol	ND	480	23	ug/kg	
88-75-5	2-Nitrophenol	ND	480	13	ug/kg	
100-02-7	4-Nitrophenol	ND	960	90	ug/kg	
87-86-5	Pentachlorophenol	ND	480	34	ug/kg	
108-95-2	Phenol	ND	240	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	480	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	480	12	ug/kg	
62-53-3	Aniline	ND	480	24	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	240	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	240	9.8	ug/kg	
100-51-6	Benzyl Alcohol	ND	480	24	ug/kg	
91-58-7	2-Chloronaphthalene	ND	240	13	ug/kg	
106-47-8	4-Chloroaniline	ND	480	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	240	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	240	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	240	17	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	240	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	240	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	480	32	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	480	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	240	24	ug/kg	
132-64-9	Dibenzofuran	ND	96	13	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	240	26	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	240	7.5	ug/kg	
84-66-2	Diethyl phthalate	ND	240	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	240	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	240	8.9	ug/kg	
118-74-1	Hexachlorobenzene	ND	240	15	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-MB	F75357.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	480	120	ug/kg	
67-72-1	Hexachloroethane	ND	240	12	ug/kg	
78-59-1	Isophorone	ND	240	11	ug/kg	
88-74-4	2-Nitroaniline	ND	480	12	ug/kg	
99-09-2	3-Nitroaniline	ND	480	26	ug/kg	
100-01-6	4-Nitroaniline	ND	480	12	ug/kg	
98-95-3	Nitrobenzene	ND	240	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	240	11	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	240	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	240	15	ug/kg	
110-86-1	Pyridine	ND	480	24	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	74%	30-130%
4165-62-2	Phenol-d5	67%	30-130%
118-79-6	2,4,6-Tribromophenol	69%	30-130%
4165-60-0	Nitrobenzene-d5	58%	30-130%
321-60-8	2-Fluorobiphenyl	75%	30-130%
1718-51-0	Terphenyl-d14	76%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

7.1.1

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39348-MB	I91221.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.8	0.83	ug/kg	
208-96-8	Acenaphthylene	ND	4.8	0.73	ug/kg	
120-12-7	Anthracene	ND	4.8	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.8	2.2	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.8	1.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.8	2.1	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.8	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.8	1.5	ug/kg	
218-01-9	Chrysene	ND	4.8	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.8	1.4	ug/kg	
206-44-0	Fluoranthene	ND	4.8	1.4	ug/kg	
86-73-7	Fluorene	ND	4.8	0.95	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.8	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	1.3	9.6	1.1	ug/kg	J
91-57-6	2-Methylnaphthalene	ND	9.6	0.90	ug/kg	
85-01-8	Phenanthrene	ND	4.8	1.0	ug/kg	
129-00-0	Pyrene	ND	4.8	1.5	ug/kg	

CAS No.	Surrogate Recoveries		Limits
4165-60-0	Nitrobenzene-d5	74%	30-130%
321-60-8	2-Fluorobiphenyl	71%	30-130%
1718-51-0	Terphenyl-d14	94%	30-130%

7.1.2

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-BS	F75358.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
65-85-0	Benzoic acid	2430	1920	79	30-130
95-57-8	2-Chlorophenol	2430	1700	70	30-130
59-50-7	4-Chloro-3-methyl phenol	2430	1510	62	30-130
120-83-2	2,4-Dichlorophenol	2430	1600	66	30-130
105-67-9	2,4-Dimethylphenol	2430	1590	66	30-130
51-28-5	2,4-Dinitrophenol	2430	538	22* a	30-130
534-52-1	4,6-Dinitro-o-cresol	2430	696	29* a	30-130
95-48-7	2-Methylphenol	2430	1730	71	30-130
	3&4-Methylphenol	4850	3250	67	30-130
88-75-5	2-Nitrophenol	2430	1580	65	30-130
100-02-7	4-Nitrophenol	2430	969	40	30-130
87-86-5	Pentachlorophenol	2430	1710	70	30-130
108-95-2	Phenol	2430	1680	69	30-130
95-95-4	2,4,5-Trichlorophenol	2430	1710	70	30-130
88-06-2	2,4,6-Trichlorophenol	2430	1510	62	30-130
62-53-3	Aniline	2430	1160	48	40-140
101-55-3	4-Bromophenyl phenyl ether	2430	1790	74	40-140
85-68-7	Butyl benzyl phthalate	2430	2100	87	40-140
100-51-6	Benzyl Alcohol	2430	450	19* a	40-140
91-58-7	2-Chloronaphthalene	2430	1840	76	40-140
106-47-8	4-Chloroaniline	2430	1420	59	40-140
111-91-1	bis(2-Chloroethoxy)methane	2430	1520	63	40-140
111-44-4	bis(2-Chloroethyl)ether	2430	1820	75	40-140
108-60-1	bis(2-Chloroisopropyl)ether	2430	2590	107	40-140
7005-72-3	4-Chlorophenyl phenyl ether	2430	1480	61	40-140
122-66-7	1,2-Diphenylhydrazine	2430	1900	78	40-140
121-14-2	2,4-Dinitrotoluene	2430	1510	62	40-140
606-20-2	2,6-Dinitrotoluene	2430	1460	60	40-140
91-94-1	3,3'-Dichlorobenzidine	2430	2000	82	40-140
132-64-9	Dibenzofuran	2430	1590	66	40-140
84-74-2	Di-n-butyl phthalate	2430	1690	70	40-140
117-84-0	Di-n-octyl phthalate	2430	2040	84	40-140
84-66-2	Diethyl phthalate	2430	1770	73	40-140
131-11-3	Dimethyl phthalate	2430	1780	73	40-140
117-81-7	bis(2-Ethylhexyl)phthalate	2430	2100	87	40-140
118-74-1	Hexachlorobenzene	2430	1700	70	40-140

* = Outside of Control Limits.

7.2.1

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-BS	F75358.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
77-47-4	Hexachlorocyclopentadiene	2430	501	21* a	40-140
67-72-1	Hexachloroethane	2430	1520	63	40-140
78-59-1	Isophorone	2430	1440	59	40-140
88-74-4	2-Nitroaniline	2430	1860	77	40-140
99-09-2	3-Nitroaniline	2430	1670	69	40-140
100-01-6	4-Nitroaniline	2430	1510	62	40-140
98-95-3	Nitrobenzene	2430	1380	57	40-140
62-75-9	n-Nitrosodimethylamine	2430	1520	63	40-140
621-64-7	N-Nitroso-di-n-propylamine	2430	1570	65	40-140
86-30-6	N-Nitrosodiphenylamine	2430	1810	75	40-140
110-86-1	Pyridine	2430	1220	50	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	67%	30-130%
4165-62-2	Phenol-d5	63%	30-130%
118-79-6	2,4,6-Tribromophenol	64%	30-130%
4165-60-0	Nitrobenzene-d5	59%	30-130%
321-60-8	2-Fluorobiphenyl	69%	30-130%
1718-51-0	Terphenyl-d14	72%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

7.2.1

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39348-BS	I91222.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2430	1610	66	40-140
208-96-8	Acenaphthylene	2430	1400	58	40-140
120-12-7	Anthracene	2430	1700	70	40-140
56-55-3	Benzo(a)anthracene	2430	2090	86	40-140
50-32-8	Benzo(a)pyrene	2430	1840	76	40-140
205-99-2	Benzo(b)fluoranthene	2430	2220	91	40-140
191-24-2	Benzo(g,h,i)perylene	2430	1900	78	40-140
207-08-9	Benzo(k)fluoranthene	2430	1870	77	40-140
218-01-9	Chrysene	2430	1760	73	40-140
53-70-3	Dibenzo(a,h)anthracene	2430	2040	84	40-140
206-44-0	Fluoranthene	2430	1970	81	40-140
86-73-7	Fluorene	2430	1620	67	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2430	1980	82	40-140
90-12-0	1-Methylnaphthalene	2430	1630	67	40-140
91-57-6	2-Methylnaphthalene	2430	1670	69	40-140
85-01-8	Phenanthrene	2430	1690	70	40-140
129-00-0	Pyrene	2430	1940	80	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	34%	15-110%
4165-62-2	Phenol-d5	33%	15-110%
118-79-6	2,4,6-Tribromophenol	38%	15-110%
4165-60-0	Nitrobenzene-d5	71%	30-130%
321-60-8	2-Fluorobiphenyl	67%	30-130%
1718-51-0	Terphenyl-d14	87%	30-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-MS	F75359.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314
OP39349-MSD	F75360.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314
MC32763-1	F75361.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	MC32763-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		2900	1630	56	2880	3550	123	74* a	30-130/30
95-57-8	2-Chlorophenol	ND		2900	1850	64	2880	1950	68	5	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		2900	1330	46	2880	1330	46	0	30-130/30
120-83-2	2,4-Dichlorophenol	ND		2900	1840	64	2880	1890	66	3	30-130/30
105-67-9	2,4-Dimethylphenol	ND		2900	1730	60	2880	1750	61	1	30-130/30
51-28-5	2,4-Dinitrophenol	ND		2900	ND	0* b	2880	ND	0* b	nc	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		2900	486	17* b	2880	563	20* b	15	30-130/30
95-48-7	2-Methylphenol	ND		2900	1840	64	2880	1960	68	6	30-130/30
	3&4-Methylphenol	ND		5790	3470	60	5760	3680	64	6	30-130/30
88-75-5	2-Nitrophenol	ND		2900	1740	60	2880	1930	67	10	30-130/30
100-02-7	4-Nitrophenol	ND		2900	ND	0* c	2880	ND	0* c	nc	30-130/30
87-86-5	Pentachlorophenol	ND		2900	1830	63	2880	1820	63	1	30-130/30
108-95-2	Phenol	ND		2900	1900	66	2880	1960	68	3	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		2900	1670	58	2880	1440	50	15	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		2900	1680	58	2880	1890	66	12	30-130/30
62-53-3	Aniline	ND		2900	1350	47	2880	1330	46	1	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		2900	1940	67	2880	1880	65	3	40-140/30
85-68-7	Butyl benzyl phthalate	ND		2900	2480	86	2880	2490	86	0	40-140/30
100-51-6	Benzyl Alcohol	ND		2900	564	19* b	2880	665	23* b	16	40-140/30
91-58-7	2-Chloronaphthalene	ND		2900	2200	76	2880	2260	78	3	40-140/30
106-47-8	4-Chloroaniline	ND		2900	1590	55	2880	1530	53	4	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		2900	1800	62	2880	1890	66	5	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		2900	2070	71	2880	2210	77	7	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		2900	2650	92	2880	2910	101	9	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		2900	1830	63	2880	1830	64	0	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		2900	2280	79	2880	2420	84	6	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		2900	1820	63	2880	1910	66	5	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		2900	2010	69	2880	1980	69	2	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		2900	2170	75	2880	2170	75	0	40-140/30
132-64-9	Dibenzofuran	ND		2900	2230	77	2880	2260	78	1	40-140/30
84-74-2	Di-n-butyl phthalate	ND		2900	2280	79	2880	2260	78	1	40-140/30
117-84-0	Di-n-octyl phthalate	ND		2900	2450	85	2880	2800	97	13	40-140/30
84-66-2	Diethyl phthalate	ND		2900	2020	70	2880	1980	69	2	40-140/30
131-11-3	Dimethyl phthalate	ND		2900	1930	67	2880	1890	66	2	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		2900	2480	86	2880	2540	88	2	40-140/30
118-74-1	Hexachlorobenzene	ND		2900	2050	71	2880	2050	71	0	40-140/30

* = Outside of Control Limits.

7.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39349-MS	F75359.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314
OP39349-MSD	F75360.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314
MC32763-1	F75361.D	1	08/15/14	WK	08/11/14	OP39349	MSF3314

The QC reported here applies to the following samples: Method: SW846 8270D

MC32763-1

CAS No.	Compound	MC32763-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		2900	356	12* b	2880	357	12* b	0	40-140/30
67-72-1	Hexachloroethane	ND		2900	1580	55	2880	1740	60	10	40-140/30
78-59-1	Isophorone	ND		2900	1590	55	2880	1580	55	1	40-140/30
88-74-4	2-Nitroaniline	ND		2900	2210	76	2880	2240	78	1	40-140/30
99-09-2	3-Nitroaniline	ND		2900	2090	72	2880	2090	73	0	40-140/30
100-01-6	4-Nitroaniline	ND		2900	1860	64	2880	2030	70	9	40-140/30
98-95-3	Nitrobenzene	ND		2900	1610	56	2880	1710	59	6	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		2900	1880	65	2880	1410	49	29	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		2900	2180	75	2880	2460	85	12	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		2900	3500	121	2880	3600	125	3	40-140/30
110-86-1	Pyridine	ND		2900	1440	50	2880	1110	39* c	26	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32763-1	Limits
367-12-4	2-Fluorophenol	75%	58%	60%	30-130%
4165-62-2	Phenol-d5	62%	64%	55%	30-130%
118-79-6	2,4,6-Tribromophenol	61%	60%	54%	30-130%
4165-60-0	Nitrobenzene-d5	56%	71%	58%	30-130%
321-60-8	2-Fluorobiphenyl	68%	69%	59%	30-130%
1718-51-0	Terphenyl-d14	67%	70%	52%	30-130%

(a) High RPD due to possible matrix interference and/or sample heterogeneity.
(b) Outside control limits. Blank Spike meets program technical requirements.
(c) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

7.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39348-MS	I91223.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397
OP39348-MSD	I91224.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397
MC32763-1	I91225.D	1	08/15/14	WK	08/11/14	OP39348	MSI3397

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC32763-1

CAS No.	Compound	MC32763-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	238		2900	1990	60	2880	1920	58	4	40-140/30
208-96-8	Acenaphthylene	51.7		2900	1650	55	2880	1540	52	7	40-140/30
120-12-7	Anthracene	189		2900	1930	60	2880	2030	64	5	40-140/30
56-55-3	Benzo(a)anthracene	23.0		2900	2480	85	2880	2460	85	1	40-140/30
50-32-8	Benzo(a)pyrene	3.6	J	2900	2140	74	2880	2180	76	2	40-140/30
205-99-2	Benzo(b)fluoranthene	4.6	J	2900	2670	92	2880	2610	90	2	40-140/30
191-24-2	Benzo(g,h,i)perylene	ND		2900	2240	77	2880	2210	77	1	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		2900	2040	70	2880	2070	72	1	40-140/30
218-01-9	Chrysene	44.6		2900	2050	69	2880	2040	69	0	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		2900	2300	79	2880	2310	80	0	40-140/30
206-44-0	Fluoranthene	58.9		2900	2300	77	2880	2290	77	0	40-140/30
86-73-7	Fluorene	373		2900	2200	63	2880	2100	60	5	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		2900	2290	79	2880	2270	79	1	40-140/30
90-12-0	1-Methylnaphthalene	2820		2900	4530	59	2880	4830	70	6	40-140/30
91-57-6	2-Methylnaphthalene	ND		2900	1910	66	2880	1880	65	2	40-140/30
85-01-8	Phenanthrene	1560		2900	3480	66	2880	3630	72	4	40-140/30
129-00-0	Pyrene	144		2900	2420	79	2880	2420	79	0	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC32763-1	Limits
4165-60-0	Nitrobenzene-d5	71%	71%	63%	30-130%
321-60-8	2-Fluorobiphenyl	61%	63%	53%	30-130%
1718-51-0	Terphenyl-d14	87%	87%	75%	30-130%

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3314-CC3270	Injection Date:	08/14/14
Lab File ID:	F75336.D	Injection Time:	16:24
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	190606	2.80	636924	3.82	364066	5.30	700389	6.53	726794	8.79	699983	10.12
Upper Limit [a]	381212	3.30	1273848	4.32	728132	5.80	1400778	7.03	1453588	9.29	1399966	10.62
Lower Limit [b]	95303	2.30	318462	3.32	182033	4.80	350195	6.03	363397	8.29	349992	9.62
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39342-MB	258606	2.80	917261	3.82	528740	5.29	872832	6.52	799364	8.78	731987	10.11
OP39342-BS	277497	2.80	1105718	3.82	640278	5.30	1012622	6.53	940476	8.78	857135	10.12
OP39342-BSD	277194	2.80	933226	3.82	532590	5.30	843493	6.53	798072	8.78	729376	10.11
OP39342-MS	327085	2.80	1121627	3.82	634971	5.30	987456	6.53	893676	8.79	854932	10.12
OP39342-MSD	312938	2.80	932977	3.82	524373	5.30	806752	6.53	746504	8.78	724055	10.12
MC32736-1	291108	2.80	990000	3.82	549871	5.29	966958	6.53	786027	8.78	798368	10.12
ZZZZZZ	261502	2.80	1039373	3.82	518191	5.29	803379	6.53	717287	8.78	698672	10.12
ZZZZZZ	270113	2.80	933652	3.82	591714	5.29	894492	6.52	823908	8.78	789263	10.12
ZZZZZZ	216311	2.80	737664	3.82	416872	5.29	646987	6.52	647479	8.78	724442	10.12
ZZZZZZ	255437	2.80	865677	3.82	469297	5.29	866256	6.53	852370	8.78	912938	10.12
ZZZZZZ	261727	2.80	858605	3.82	481951	5.29	731100	6.53	776029	8.78	835820	10.12
ZZZZZZ	268619	2.80	879420	3.82	483361	5.30	733702	6.53	913537	8.78	982905	10.12
ZZZZZZ	230547	2.80	766416	3.82	434173	5.29	668718	6.53	714213	8.78	770842	10.12
ZZZZZZ	256498	2.80	863912	3.82	557488	5.29	859958	6.53	763085	8.78	839643	10.12
ZZZZZZ	268170	2.80	881008	3.82	482616	5.30	744700	6.53	773333	8.78	838152	10.12
ZZZZZZ	269137	2.80	868420	3.83	475478	5.31	783577	6.53	757361	8.78	820206	10.12
ZZZZZZ	193979	2.80	747056	3.82	397330	5.30	581152	6.53	696823	8.78	761565	10.12
ZZZZZZ	292052	2.80	869616	3.82	472860	5.29	731474	6.53	774421	8.78	1031270	10.13
ZZZZZZ	243896	2.80	796793	3.83	446095	5.31	696818	6.53	754874	8.78	790005	10.12
ZZZZZZ	278914	2.80	935803	3.83	519167	5.31	812250	6.53	892994	8.79	928742	10.13
OP39349-MB	253401	2.80	862707	3.82	552064	5.29	799448	6.53	876199	8.78	814839	10.12
OP39349-BS	298745	2.80	995916	3.82	549783	5.30	817795	6.53	750825	8.79	790594	10.12
OP39349-MS	244619	2.80	783622	3.83	424628	5.31	661223	6.55	747724	8.79	787787	10.13
OP39349-MSD	287185	2.80	932355	3.83	487949	5.32	770400	6.55	849010	8.79	780481	10.13
MC32763-1	226521	2.80	759312	3.82	409311	5.31	640558	6.54	773108	8.79	830482	10.12
ZZZZZZ	170097	2.80	684458	3.82	392276	5.30	633760	6.53	768389	8.78	805071	10.12
ZZZZZZ	250731	2.80	856239	3.82	467151	5.30	706220	6.53	866466	8.78	938903	10.12
ZZZZZZ	233288	2.80	783782	3.82	491459	5.29	736246	6.53	698612	8.78	739606	10.12
ZZZZZZ	251218	2.80	843543	3.82	543674	5.29	808949	6.53	755309	8.78	793566	10.12

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12

7.4.1

Semivolatile Internal Standard Area Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3314-CC3270	Injection Date:	08/14/14
Lab File ID:	F75336.D	Injection Time:	16:24
Instrument ID:	GCMSF	Method:	SW846 8270D

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.1

Semivolatile Internal Standard Area Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3397-CC3386	Injection Date:	08/15/14
Lab File ID:	I91207.D	Injection Time:	15:28
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	432999	4.09	938241	5.14	497917	6.67	847169	8.05	598340	10.83	1546574	12.32
Upper Limit [a]	865998	4.59	1876482	5.64	995834	7.17	1694338	8.55	1196680	11.33	3093148	12.82
Lower Limit [b]	216500	3.59	469121	4.64	248959	6.17	423585	7.55	299170	10.33	773287	11.82

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39394-MB	410403	4.09	895552	5.13	473612	6.66	793466	8.05	552758	10.83	1462882	12.31
OP39394-BS	413954	4.09	896913	5.13	470146	6.67	799634	8.05	572136	10.83	1477530	12.32
OP39394-BSD	402406	4.09	873682	5.13	459698	6.67	781619	8.05	554328	10.83	1405938	12.32
OP39394-MS	401119	4.09	878700	5.14	462494	6.67	787104	8.05	563224	10.83	1431320	12.32
OP39394-MSD	411415	4.09	907550	5.14	476826	6.67	808977	8.05	580949	10.83	1469123	12.32
MC32644-25	411599	4.08	904546	5.13	476398	6.66	805746	8.05	559738	10.83	1476807	12.31
ZZZZZZ	431824	4.09	943418	5.14	502558	6.67	840721	8.05	585760	10.83	1317331	12.31
ZZZZZZ	363320	4.08	795000	5.13	418978	6.66	700747	8.05	486074	10.82	1282793	12.31
ZZZZZZ	367010	4.08	799899	5.13	418686	6.66	710653	8.05	495096	10.82	1316939	12.31
ZZZZZZ	377247	4.09	823128	5.13	430386	6.66	733955	8.05	507044	10.82	1340823	12.31
ZZZZZZ	415605	4.08	916216	5.13	479530	6.66	807783	8.05	565485	10.82	1482794	12.31
ZZZZZZ	410985	4.08	900360	5.13	476402	6.66	801578	8.05	563883	10.82	1456677	12.31
ZZZZZZ	384701	4.08	844464	5.13	443734	6.66	746484	8.05	526905	10.82	1348865	12.31
OP39348-MB	525666	4.08	1148841	5.13	598483	6.66	988555	8.05	653132	10.82	1622888	12.31
OP39348-BS	530199	4.08	1141573	5.14	591929	6.66	974155	8.05	649063	10.83	1564948	12.32
OP39348-MS	507614	4.09	1131776	5.14	591786	6.69	980097	8.07	634166	10.83	1527990	12.32
OP39348-MSD	508190	4.09	1132787	5.14	617539	6.69	975899	8.08	625771	10.83	1495026	12.32
MC32763-1	480785	4.09	1085166	5.14	599588	6.68	928000	8.06	594823	10.83	1459533	12.32
OP39407-MB	392472	4.08	873357	5.13	464114	6.67	778692	8.05	557447	10.82	1405505	12.31
OP39407-BS	479202	4.09	1048976	5.14	535427	6.66	885423	8.05	635576	10.83	1583336	12.32
ZZZZZZ	431789	4.08	959397	5.13	500324	6.66	844330	8.05	583802	10.82	1504670	12.31
ZZZZZZ	481296	4.08	1032047	5.13	512197	6.66	835271	8.05	623250	10.84	1454612	12.34

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.4.2

Semivolatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC32763-1	F75361.D	60	55	54	58	59	52
OP39349-BS	F75358.D	67	63	64	59	69	72
OP39349-MB	F75357.D	74	67	69	58	75	76
OP39349-MS	F75359.D	75	62	61	56	68	67
OP39349-MSD	F75360.D	58	64	60	71	69	70

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.5.1

Semivolatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC32763-1	I91225.D	63	53	75
OP39348-BS	I91222.D	71	67	87
OP39348-MB	I91221.D	74	71	94
OP39348-MS	I91223.D	71	61	87
OP39348-MSD	I91224.D	71	63	87

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

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QC Data Summaries

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Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MB	YZ91281.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.72	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.60	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	107%	61-167%
460-00-4	Bromofluorobenzene (S)	107%	61-167%

8.1.1

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MB	BK40149.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-3

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	94%	36-173%
460-00-4	Bromofluorobenzene (S)	94%	36-173%

8.1.2

Method Blank Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4541-MB	AB85328.D	1	08/12/14	AF	n/a	n/a	GAB4541

The QC reported here applies to the following samples: Method: SW846 8015

MC32763-1

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	94%	61-116%

8.1.3

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-BS	YZ91282.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	33.2	32.3	97	59-142
106-93-4	1,2-Dibromoethane	33.2	33.5	101	56-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	101%	61-167%
460-00-4	Bromofluorobenzene (S)	109%	61-167%

8.2.1

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-BS	BK40150.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.072	101	60-140
106-93-4	1,2-Dibromoethane	0.071	0.071	100	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	91%	36-173%
460-00-4	Bromofluorobenzene (S)	90%	36-173%

8.2.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4541-BSP	AB85329.D	1	08/12/14	AF	n/a	n/a	GAB4541
GAB4541-BSD	AB85330.D	1	08/12/14	AF	n/a	n/a	GAB4541

The QC reported here applies to the following samples: Method: SW846 8015

MC32763-1

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	31.7	98	32.2	99	2	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	99%	100%	61-116%

8.3.1

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39346-MS	YZ91283.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
OP39346-MSD	YZ91284.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620
MC32707-2	YZ91285.D	1	08/11/14	SZ	08/11/14	OP39346	GYZ7620

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-1

CAS No.	Compound	MC32707-2 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		87.3	91.8	105	84.8	93.0	110	1	40-156/27
106-93-4	1,2-Dibromoethane	ND		87.3	95.7	110	84.8	95.0	112	1	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32707-2	Limits
460-00-4	Bromofluorobenzene (S)	115%	118%	122%	61-167%
460-00-4	Bromofluorobenzene (S)	114%	114%	119%	61-167%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39418-MS	BK40151.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
OP39418-MSD	BK40152.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303
MC32700-7	BK40153.D	1	08/19/14	AP	08/14/14	OP39418	GBK1303

The QC reported here applies to the following samples: Method: SW846 8011

MC32763-3

CAS No.	Compound	MC32700-7 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.067	94	0.071	0.075	106	11	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.072	101	0.071	0.071	100	1	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC32700-7	Limits
460-00-4	Bromofluorobenzene (S)	84%	81%	84%	36-173%
460-00-4	Bromofluorobenzene (S)	86%	82%	85%	36-173%

* = Outside of Control Limits.

8.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC32787-1MS	AB85332.D	1	08/12/14	AF	n/a	n/a	GAB4541
MC32787-1MSD	AB85333.D	1	08/12/14	AF	n/a	n/a	GAB4541
MC32787-1	AB85331.D	1	08/12/14	AF	n/a	n/a	GAB4541

The QC reported here applies to the following samples: Method: SW846 8015

MC32763-1

CAS No.	Compound	MC32787-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	ND		55.2	55.6	101	55.2	55.3	100	1	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC32787-1	Limits
	2,3,4-Trifluorotoluene	101%	100%	95%	61-116%

8.4.3

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32763-3	BK40158.D	88	89
OP39418-BS	BK40150.D	91	90
OP39418-MB	BK40149.D	94	94
OP39418-MS	BK40151.D	84	86
OP39418-MSD	BK40152.D	81	82

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC32763-1	YZ91293.D	116	122
OP39346-BS	YZ91282.D	101	109
OP39346-MB	YZ91281.D	107	107
OP39346-MS	YZ91283.D	115	114
OP39346-MSD	YZ91284.D	118	114

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015	Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC32763-1	AB85339.D	91
GAB4541-BSD	AB85330.D	100
GAB4541-BSP	AB85329.D	99
GAB4541-MB	AB85328.D	94
MC32787-1MS	AB85332.D	101
MC32787-1MSD	AB85333.D	100

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.3

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4540-CC4486	Injection Date:	08/12/14
Lab File ID:	AB85326.D	Injection Time:	04:59
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std	20.32	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GAB4541-MB	AB85328.D	08/12/14	08:21		20.32
GAB4542-MB	AB85328A.D	08/12/14	08:21	20.32	20.32
GAB4541-BSP	AB85329.D	08/12/14	08:59		20.32
GAB4542-BSP	AB85329A.D	08/12/14	08:59	20.32	20.32
GAB4542-BSD	AB85330A.D	08/12/14	09:37	20.32	20.32
GAB4541-BSD	AB85330.D	08/12/14	09:37		20.32
MC32787-1	AB85331.D	08/12/14	10:15		20.32
MC32787-1MS	AB85332.D	08/12/14	10:52		20.32
MC32787-1MSD	AB85333.D	08/12/14	11:30		20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4542-CC4486	Injection Date:	08/12/14
Lab File ID:	AB85334A.D	Injection Time:	12:07
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85335.D	08/12/14	12:45	20.32
ZZZZZZ	AB85337.D	08/12/14	14:02	20.32
ZZZZZZ	AB85338.D	08/12/14	14:39	20.32
MC32763-1	AB85339.D	08/12/14	15:17	20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBK1303-ICC1303	Injection Date:	08/19/14
Lab File ID:	BK40145.D	Injection Time:	16:10
Instrument ID:	GCBK	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	2.41	2.72

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39418-MB	BK40149.D	08/19/14	17:05	2.41	2.72
OP39418-BS	BK40150.D	08/19/14	17:19	2.41	2.72
OP39418-MS	BK40151.D	08/19/14	17:32	2.41	2.72
OP39418-MSD	BK40152.D	08/19/14	17:46	2.41	2.72
MC32700-7	BK40153.D	08/19/14	18:00	2.41	2.72
ZZZZZZ	BK40154.D	08/19/14	18:13	2.41	2.72
ZZZZZZ	BK40155.D	08/19/14	18:27	2.41	2.72
ZZZZZZ	BK40156.D	08/19/14	18:41	2.41	2.72
ZZZZZZ	BK40157.D	08/19/14	18:55	2.41	2.72
MC32763-3	BK40158.D	08/19/14	19:08	2.41	2.72
GBK1303-ECC130	BK40159.D	08/19/14	19:22	2.41	2.72

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7620-ICC7620	Injection Date:	08/11/14
Lab File ID:	YZ91278.D	Injection Time:	18:16
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.14	4.39

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39346-MB	YZ91281.D	08/11/14	19:30	4.14	4.39
OP39346-BS	YZ91282.D	08/11/14	19:55	4.14	4.39
OP39346-MS	YZ91283.D	08/11/14	20:20	4.14	4.39
OP39346-MSD	YZ91284.D	08/11/14	20:45	4.14	4.39
MC32707-2	YZ91285.D	08/11/14	21:10	4.14	4.39
ZZZZZZ	YZ91286.D	08/11/14	21:36	4.14	4.39
ZZZZZZ	YZ91287.D	08/11/14	22:00	4.14	4.39
ZZZZZZ	YZ91288.D	08/11/14	22:25	4.14	4.39
ZZZZZZ	YZ91289.D	08/11/14	22:50	4.14	4.39
ZZZZZZ	YZ91290.D	08/11/14	23:15	4.14	4.39

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7620-CC7620	Injection Date:	08/11/14
Lab File ID:	YZ91291.D	Injection Time:	23:41
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.14	4.39

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
ZZZZZZ	YZ91292.D	08/12/14	00:06	4.14	4.39
MC32763-1	YZ91293.D	08/12/14	00:31	4.14	4.39
ZZZZZZ	YZ91294.D	08/12/14	00:57	4.14	4.38
GYZ7620-ECC7620	YZ91295.D	08/12/14	01:21	4.14	4.39

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.5

GC Surrogate Retention Time Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4541-CC4488	Injection Date:	08/12/14
Lab File ID:	AB85334.D	Injection Time:	12:07
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT
Check Std	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT
ZZZZZZ	AB85335.D	08/12/14	12:45	20.32
ZZZZZZ	AB85337.D	08/12/14	14:02	20.32
ZZZZZZ	AB85338.D	08/12/14	14:39	20.32
MC32763-1	AB85339.D	08/12/14	15:17	20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #1

8.6.6

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General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC32763
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC32763-1 Analyzed: 13-AUG-14 by CF Method: SM21 2540 B MOD.
ClientID: SVE43-080814 (30-32')

Wet Weight (Total)	32.583	g
Tare Weight	24.908	g
Dry Weight (Total)	31.359	g
Solids, Percent	84.1	%

9.1

Roxana SVE 4th Street Extension 2014 Data Review

Laboratory SDG: MC33045

Data Reviewer: Melissa Mansker

Peer Reviewer: Elizabeth Kunkel

Date Reviewed: 9/30/2014

Guidance: USEPA National Functional Guidelines for Superfund Organic Methods Data Review 2014

Sample Identification	Sample Identification
SVE44-082014 (30-36')	EQB-082014
TB-082014-HCL	TB-082014-ST

1.0 Data Package Completeness

Were all items delivered as specified in the QAPP and COC as appropriate?

Yes

2.0 Laboratory Case Narrative \ Cooler Receipt Form

Were problems noted in the laboratory case narrative or cooler receipt form?

Yes, the laboratory case narrative indicated analytes were detected in the method blanks, and although not indicated in the laboratory case narrative, toluene was detected in the equipment blank. VOC and SVOC LCS/LCSD recoveries and VOC LCS/LCSD RPDs were outside evaluation criteria. VOC, SVOC and PAH MS/MSD recoveries were outside of evaluation criteria in sample SVE44-082014 (30-36'). Internal standard area recoveries were outside criteria in the SVOC method blank. Additionally, the initial calibration verification recovery for bis(2-chloroisopropyl)ether exceeded 30 percent difference (%D).

The cooler receipt form indicated samples were received by the laboratory at 1.4°C which is outside temperature criteria 4°C ± 2°C. All samples were received in good condition; no qualification of data was required.

3.0 Holding Times

Were samples extracted/analyzed within applicable limits?

Yes

4.0 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

Yes

Blank ID	Parameter	Analyte	Concentration/ Amount
EQB-082014	VOCs	Toluene	0.0030 mg/L
OP39514-MB	SVOCs	Di-n-butyl phthalate	0.00033 mg/L
OP39515-MB	PAHs	Phenanthrene	0.000022 mg/L

Analytical data that were reported non-detect or at concentrations greater than five times (5X) the associated blank concentration did not require qualification. Please see Section 12.0 of this review for additional qualifications regarding samples associated with the equipment blank.

5.0 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No

LCS/ LCSD ID	Parameter	Analyte	LCS/ LCSD Recovery	RPD	LCS/LCSD /RPD Criteria
MSM2398-BS/BSD	VOCs	Acrolein	82/**62**	**28**	70-130/25
MSM2398-BS/BSD	VOCs	Chloromethane	84/**66**	24	70-130/25
MSM2398-BS/BSD	VOCs	Dichlorodifluoromethane	**60**/**46**	**26**	70-130/25
MSN3329-BS/BSD	VOCs	Acetone	70/**65**	7	70-130/25
MSN3329-BS/BSD	VOCs	Bromomethane	**68**/71	5	70-130/25
MSN3329-BS/BSD	VOCs	2-Hexanone	**64**/**66**	3	70-130/25
OP39507-BS	SVOCs	Hexachlorocyclopentadiene	**31**	NA	40-140

Analytical data that required qualification based on LCS/LCSD data are included in the table below. Analytical data reported as non-detect and associated with LCS recoveries above evaluation criteria, indicating a possible high bias, did not require qualification. LCS/LCSD MSN3329-BS/BSD is associated with the equipment blank and trip blank; blanks are quality control samples and are not qualified.

Sample ID	Parameter	Analyte	Qualification
SVE44-082014 (30-36')	VOCs	Acrolein	**UJ**
SVE44-082014 (30-36')	VOCs	Chloromethane	**UJ**
SVE44-082014 (30-36')	VOCs	Dichlorodifluoromethane	**UJ**
SVE44-082014 (30-36')	SVOCs	Hexachlorocyclopentadiene	**UJ**

6.0 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

Yes

7.0 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples analyzed as part of this SDG?

Yes, sample SVE44-082014 (30-36') was spiked and analyzed for VOCs, SVOCs, PAHs, and TPH-GRO.

Were MS/MSD recoveries within evaluation criteria?

No

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE44-082014 (30-36')	VOCs	Acetone	**58**/**52**	7	70-130/30
SVE44-082014 (30-36')	VOCs	Acrolein	**45**/**39**	11	70-130/30
SVE44-082014 (30-36')	VOCs	Bromomethane	81/**69**	13	70-130/30
SVE44-082014 (30-36')	VOCs	n-Butylbenzene	**59**/**63**	10	70-130/30
SVE44-082014 (30-36')	VOCs	sec-Butylbenzene	**63**/**67**	10	70-130/30
SVE44-082014 (30-36')	VOCs	tert-Butylbenzene	**65**/**68**	9	70-130/30
SVE44-082014 (30-36')	VOCs	2-Chloroethyl vinyl ether	**0**/**0**	NA	10-160/30
SVE44-082014 (30-36')	VOCs	Chloromethane	74/**61**	15	70-130/30
SVE44-082014 (30-36')	VOCs	o-Chlorotoluene	**68**/**69**	6	70-130/30
SVE44-082014 (30-36')	VOCs	p-Chlorotoluene	**67**/**67**	3	70-130/30
SVE44-082014 (30-36')	VOCs	1,3-Dichlorobenzene	**68**/**69**	5	70-130/30
SVE44-082014 (30-36')	VOCs	1,4-Dichlorobenzene	**68**/**68**	3	70-130/30
SVE44-082014 (30-36')	VOCs	Dichlorodifluoromethane	**49**/**40**	15	70-130/30
SVE44-082014 (30-36')	VOCs	Hexachlorobutadiene	**51**/**57**	13	70-130/30
SVE44-082014 (30-36')	VOCs	2-Hexanone	**67**/76	16	70-130/30
SVE44-082014 (30-36')	VOCs	p-Isopropyltoluene	**62**/**66**	10	70-130/30
SVE44-082014 (30-36')	VOCs	n-Propylbenzene	**68**/70	6	70-130/30
SVE44-082014 (30-36')	VOCs	1,2,3-Trichlorobenzene	**58**/**64**	14	70-130/30
SVE44-082014 (30-36')	VOCs	1,2,4-Trichlorobenzene	**54**/**59**	12	70-130/30
SVE44-082014 (30-36')	VOCs	Trichlorofluoromethane	77/**67**	10	70-130/30
SVE44-082014 (30-36')	VOCs	1,2,4-Trimethylbenzene	**68**/71	9	70-130/30
SVE44-082014 (30-36')	VOCs	1,3,5-Trimethylbenzene	**64**/**67**	8	70-130/30
SVE44-082014 (30-36')	VOCs	Vinyl acetate	**46**/**46**	4	70-130/30
SVE44-082014 (30-36')	VOCs	Vinyl chloride	76/**65**	12	70-130/30

MS/MSD ID	Parameter	Analyte	MS/MSD Recovery	RPD	MS/MSD/ RPD Criteria
SVE44-082014 (30-36')	SVOCs	Hexachlorocyclopentadiene	**34**/**31**	7	40-140/30
SVE44-082014 (30-36')	VOCs by 8011	1,2-Dibromo-3-chloropropane	**163**/148	10	40-156/27

LCS recoveries were within evaluation criteria with the exception of compounds listed and qualified as appropriate in Section 5.0 of this data review. No further qualification of the data was required.

8.0 Internal Standard (IS) Recoveries

Were internal standard area recoveries within evaluation criteria?

No

Sample ID	Parameter	Analyte	IS Area Recovery	IS Criteria
OP39507-MB	SVOCs	1,4-Dichlorobenzene-d_4	**16755**	17270-69080
OP39507-MB	SVOCs	Naphthalene-d_8	**60011**	70769-283076
OP39507-MB	SVOCs	Acenaphthene-d_{10}	**39690**	46878-187512
OP39507-MB	SVOCs	Phenanthrene-d_{10}	**79480**	86367-345466

Method blank OP39507-MB is a quality control sample and is not qualified; no qualification of data was required.

9.0 Laboratory Duplicate Results

Were laboratory duplicate samples collected as part of this SDG?

No

10.0 Field Duplicate Results

Were field duplicate samples collected as part of this SDG?

No

11.0 Sample Dilutions

For samples that were diluted and nondetect, were undiluted results also reported?

Not applicable; samples analyzed did not require dilution.

12.0 Additional Qualifications

Were additional qualifications applied?

Yes, professional judgment was also used to qualify as estimated, however not reject, data that was associated with equipment blank EQB-082014, due to comparable historical detections.

Sample ID	Parameter	Analyte	New Reporting Limit (RL)	Qualification
SVE44-082014 (30-36')	VOCs	Toluene	-	**J**

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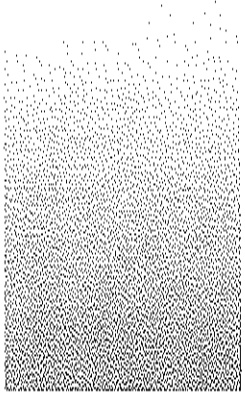
09/12/14



Technical Report for

Shell Oil

URSMOSTL: Roxana 4th St. Extension Well Instal. 900 South Central Ave, Roxana,IL

21562973.19200

Accutest Job Number: MC33045

Sampling Date: 08/20/14

Report to:

URS Corporation

Melissa.mansker@urs.com

ATTN: Melissa Mansker

Total number of pages in report: **113**

Reviewed on 9/30/2014

Reza Pand
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Matthew Morrell 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) DoD ELAP (L-A-B L2235)

Test results relate only to samples analyzed.

Sections: 1 2 3 4 5 6 7 8 9

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Sample Summary

Shell Oil

Job No: MC33045

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Collected Date	Time By	Received	Matrix Code	Matrix Type	Client Sample ID
MC33045-1	08/20/14	12:30 EA	08/21/14	SO	Soil	SVE44-082014(30-36')
MC33045-1D	08/20/14	12:30 EA	08/21/14	SO	Soil Dup/MSD	SVE44-082014(30-36')
MC33045-1S	08/20/14	12:30 EA	08/21/14	SO	Soil Matrix Spike	SVE44-082014(30-36')
MC33045-2	08/20/14	16:00 EA	08/21/14	AQ	Equipment Blank	EQB-082014
MC33045-3	08/20/14	00:00 EA	08/21/14	AQ	Trip Blank Water	TB-082014-HCL
MC33045-4	08/20/14	00:00 EA	08/21/14	AQ	Trip Blank Water	TB-082014-ST

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

ACCUTEST LABORATORIES

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SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Shell Oil	Job No	MC33045
Site:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Centr	Report Date	9/5/2014 10:33:34 AM

2 Sample(s) and 2 Trip Blank(s) were collected on 08/20/2014 and were received at Accutest on 08/21/2014 properly preserved, at 1.4 Deg. C and intact. These Samples received an Accutest job number of MC33045. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report. 1-Chlorohexane, Benzenethiol, Dibenz(a,h)acridine, Indene, and Quinoline were searched in the library search and reported only if detections were found.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260C

Matrix AQ **Batch ID:** MSN3329

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC33209-3MS, MC33209-3MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- MSN3329-BS Recovery(s) for 2-Hexanone, Bromomethane are outside control limits. Blank Spike meets program technical requirements.
- MSN3329-BSD Recovery(s) for Acetone, 2-Hexanone are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 2-Hexanone, Acetone are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 2-Butanone (MEK), 2-Hexanone, Acetone are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.

Matrix SO **Batch ID:** MSM2398

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33045-1MS, MC33045-1MSD were used as the QC samples indicated.
- MSM2398-BS Recovery(s) for Dichlorodifluoromethane are outside control limits. Blank Spike meets program technical requirements.
- MSM2398-BSD Recovery(s) for Acrolein, Chloromethane, Dichlorodifluoromethane are outside control limits. Blank Spike meets program technical requirements.
- Matrix Spike Recovery(s) for 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2-Chloroethyl vinyl ether, 2-Hexanone, Acetone, Acrolein, Dichlorodifluoromethane, Hexachlorobutadiene, n-Butylbenzene, n-Propylbenzene, o-Chlorotoluene, p-Chlorotoluene, p-Isopropyltoluene, sec-Butylbenzene, tert-Butylbenzene, Vinyl Acetate are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- Matrix Spike Duplicate Recovery(s) for 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,3,5-Trimethylbenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2-Chloroethyl vinyl ether, Acetone, Acrolein, Bromomethane, Chloromethane, Dichlorodifluoromethane, Hexachlorobutadiene, n-Butylbenzene, o-Chlorotoluene, p-Chlorotoluene, p-Isopropyltoluene, sec-Butylbenzene, tert-Butylbenzene, Trichlorofluoromethane, Vinyl Acetate, Vinyl chloride are outside control limits. Outside control limits due to possible matrix interference. Refer to Blank Spike.
- RPD of MSM2398-BSD for Acrolein, Dichlorodifluoromethane: Outside control limits. Blank Spike meets program technical requirements.

Extractables by GCMS By Method SW846 8270D

Matrix AQ	Batch ID: OP39514

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33000-1MS, MC33000-1MSD were used as the QC samples indicated.

Matrix SO	Batch ID: OP39507

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC33045-1MS, MC33045-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Initial calibration verification MSR1458-ICV1457 for bis(2-chloroisopropyl)ether exceed 30% Difference (response bias high). Associated samples are non-detect for this compound.
- OP39507-BS/MS/MSD Recovery(s) for Hexachlorocyclopentadiene are outside control limits. Blank Spike meets program technical requirements.
- OP39507-MB has interanal standards outside control limits. Confirmed by reanalysis.

Extractables by GCMS By Method SW846 8270D BY SIM

Matrix AQ	Batch ID: OP39515

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33000-2MS, MC33000-2MSD were used as the QC samples indicated.

Matrix SO	Batch ID: OP39508

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) MC33045-1MS, MC33045-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Volatiles by GC By Method SW846 8011

Matrix AQ	Batch ID: OP39646

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33200-2MS, MC33200-2MSD were used as the QC samples indicated.
- All samples were analyzed within the recommended method holding time.
- Matrix Spike Duplicate Recovery(s) for 1,2-Dibromo-3-chloropropane are outside control limits. Outside control limits due to possible matrix interference.

Matrix SO	Batch ID: OP39555

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33045-1MS, MC33045-1MSD were used as the QC samples indicated.
- Matrix Spike Recovery(s) for 1,2-Dibromo-3-chloropropane are outside control limits. Outside control limits due to possible matrix interference.

Volatiles by GC By Method SW846 8015

Matrix AQ	Batch ID: GAB4558

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC33192-2MS, MC33192-2MSD were used as the QC samples indicated.
- MC33045-2: The pH of the sample aliquot for VOA analysis was >2 at time of analysis.
- Calibration check standard GAB4486-ICC4486, GAB4486-ICV4486, GAB4559-CC4486 not associated with this job.

Matrix SO	Batch ID: GWX3651

- All samples were analyzed within the recommended method holding time.
- Sample(s) MC33045-1MS, MC33045-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- Calibration check standard GWX3234-ICC3234, GWX3234-ICV3234, GWX3650-CC3234 not associated with this job.

Wet Chemistry By Method SM21 2540 B MOD.

Matrix SO	Batch ID: GN48067

- Sample(s) MC33045-1DUP were used as the QC samples for Solids, Percent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC33045).

Summary of Hits

Job Number: MC33045
Account: Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Collected: 08/20/14

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC33045-1	SVE44-082014(30-36')					
Benzene		0.00085	0.00061	0.00041	mg/kg	SW846 8260C
Ethylbenzene		0.0016 J	0.0024	0.00084	mg/kg	SW846 8260C
Toluene		0.0022 J	0.0061	0.00025	mg/kg	SW846 8260C
m,p-Xylene		0.00077 J	0.0024	0.00053	mg/kg	SW846 8260C
Xylene (total)		0.0011 J	0.0024	0.00027	mg/kg	SW846 8260C
Total TIC, Volatile		0.059 J			mg/kg	
2-Methylnaphthalene		0.0012 J	0.010	0.00094	mg/kg	SW846 8270D BY SIM
Total TIC, Semi-Volatile		0.56 J			mg/kg	
TPH-GRO (VOA)		2.55 J	12	1.8	mg/kg	SW846 8015
MC33045-2	EQB-082014					
Toluene		3.0	1.0	0.33	ug/l	SW846 8260C
Total TIC, Volatile		6.9 J			ug/l	
MC33045-3	TB-082014-HCL					
No hits reported in this sample.						
MC33045-4	TB-082014-ST					
No hits reported in this sample.						

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Sample Results

Report of Analysis

Report of Analysis

4.1

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	M67804.D	1	08/25/14	KD	n/a	n/a	MSM2398
Run #2							

	Initial Weight	Final Volume
Run #1	4.27 g	5.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	0.012	0.0034	mg/kg	
107-02-8	Acrolein	ND	0.030	0.011	mg/kg	UJ
107-13-1	Acrylonitrile	ND	0.030	0.0033	mg/kg	
71-43-2	Benzene	0.00085	0.00061	0.00041	mg/kg	
108-86-1	Bromobenzene	ND	0.0061	0.00030	mg/kg	
74-97-5	Bromochloromethane	ND	0.0061	0.00042	mg/kg	
75-27-4	Bromodichloromethane	ND	0.0024	0.00025	mg/kg	
75-25-2	Bromoform	ND	0.0024	0.00043	mg/kg	
74-83-9	Bromomethane	ND	0.0024	0.00073	mg/kg	
78-93-3	2-Butanone (MEK)	ND	0.012	0.0037	mg/kg	
104-51-8	n-Butylbenzene	ND	0.0061	0.00029	mg/kg	
135-98-8	sec-Butylbenzene	ND	0.0061	0.00090	mg/kg	
98-06-6	tert-Butylbenzene	ND	0.0061	0.00026	mg/kg	
75-15-0	Carbon disulfide	ND	0.0061	0.00016	mg/kg	
56-23-5	Carbon tetrachloride	ND	0.0024	0.00027	mg/kg	
108-90-7	Chlorobenzene	ND	0.0024	0.00019	mg/kg	
75-00-3	Chloroethane	ND	0.0061	0.00092	mg/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	0.0061	0.0015	mg/kg	
67-66-3	Chloroform	ND	0.0024	0.00020	mg/kg	
74-87-3	Chloromethane	ND	0.0061	0.00068	mg/kg	UJ
95-49-8	o-Chlorotoluene	ND	0.0061	0.00023	mg/kg	
106-43-4	p-Chlorotoluene	ND	0.0061	0.00032	mg/kg	
124-48-1	Dibromochloromethane	ND	0.0024	0.00039	mg/kg	
95-50-1	1,2-Dichlorobenzene	ND	0.0024	0.00026	mg/kg	
541-73-1	1,3-Dichlorobenzene	ND	0.0024	0.00037	mg/kg	
106-46-7	1,4-Dichlorobenzene	ND	0.0024	0.00042	mg/kg	
75-71-8	Dichlorodifluoromethane	ND	0.0024	0.00098	mg/kg	UJ
75-34-3	1,1-Dichloroethane	ND	0.0024	0.00032	mg/kg	
107-06-2	1,2-Dichloroethane	ND	0.0024	0.00039	mg/kg	
75-35-4	1,1-Dichloroethene	ND	0.0024	0.00050	mg/kg	
156-59-2	cis-1,2-Dichloroethene	ND	0.0024	0.00055	mg/kg	
156-60-5	trans-1,2-Dichloroethene	ND	0.0024	0.00051	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	0.0024	0.00051	mg/kg	
142-28-9	1,3-Dichloropropane	ND	0.0061	0.00040	mg/kg	
594-20-7	2,2-Dichloropropane	ND	0.0061	0.00068	mg/kg	
563-58-6	1,1-Dichloropropene	ND	0.0061	0.00032	mg/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	0.0024	0.00027	mg/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	0.0024	0.00032	mg/kg	
123-91-1	1,4-Dioxane	ND	0.030	0.024	mg/kg	
97-63-2	Ethyl methacrylate	ND	0.0061	0.00043	mg/kg	
100-41-4	Ethylbenzene	0.0016	0.0024	0.00084	mg/kg	J
87-68-3	Hexachlorobutadiene	ND	0.0061	0.00070	mg/kg	
591-78-6	2-Hexanone	ND	0.012	0.00092	mg/kg	
98-82-8	Isopropylbenzene	ND	0.0061	0.00020	mg/kg	
99-87-6	p-Isopropyltoluene	ND	0.0061	0.00021	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.0024	0.00022	mg/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	0.0061	0.00065	mg/kg	
74-95-3	Methylene bromide	ND	0.0061	0.00055	mg/kg	
75-09-2	Methylene chloride	ND	0.0024	0.00064	mg/kg	
91-20-3	Naphthalene	ND	0.0061	0.00048	mg/kg	
103-65-1	n-Propylbenzene	ND	0.0061	0.00018	mg/kg	
100-42-5	Styrene	ND	0.0061	0.00021	mg/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.0061	0.00049	mg/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.0024	0.00048	mg/kg	
127-18-4	Tetrachloroethene	ND	0.0024	0.00038	mg/kg	
108-88-3	Toluene	0.0022	0.0061	0.00025	mg/kg	J J
87-61-6	1,2,3-Trichlorobenzene	ND	0.0061	0.00052	mg/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	0.0061	0.00062	mg/kg	
71-55-6	1,1,1-Trichloroethane	ND	0.0024	0.00026	mg/kg	
79-00-5	1,1,2-Trichloroethane	ND	0.0024	0.00070	mg/kg	
79-01-6	Trichloroethene	ND	0.0024	0.00030	mg/kg	
75-69-4	Trichlorofluoromethane	ND	0.0024	0.00048	mg/kg	
96-18-4	1,2,3-Trichloropropane	ND	0.0061	0.00035	mg/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	0.0061	0.0017	mg/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	0.0061	0.0018	mg/kg	
108-05-4	Vinyl Acetate	ND	0.0061	0.0019	mg/kg	
75-01-4	Vinyl chloride	ND	0.0024	0.0011	mg/kg	
	m,p-Xylene	0.00077	0.0024	0.00053	mg/kg	J
95-47-6	o-Xylene	ND	0.0024	0.00034	mg/kg	
1330-20-7	Xylene (total)	0.0011	0.0024	0.00027	mg/kg	J

ND = Not detected MDL = Method Detection Limit
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E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.1

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	102%		70-130%
2037-26-5	Toluene-D8	90%		70-130%
460-00-4	4-Bromofluorobenzene	84%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
75-28-5	Isobutane	4.76	.012	mg/kg	JN
106-97-8	Butane	5.08	.027	mg/kg	JN
78-78-4	Butane, 2-methyl-	6.07	.013	mg/kg	JN
109-66-0	Pentane	6.47	.007	mg/kg	JN
	Total TIC, Volatile		.059	mg/kg	J

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8270D SW846 3546	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	R39577.D	1	08/26/14	WK	08/21/14	OP39507	MSR1458
Run #2							

	Initial Weight	Final Volume
Run #1	20.6 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	0.50	0.063	mg/kg	
95-57-8	2-Chlorophenol	ND	0.25	0.011	mg/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	0.50	0.013	mg/kg	
120-83-2	2,4-Dichlorophenol	ND	0.50	0.015	mg/kg	
105-67-9	2,4-Dimethylphenol	ND	0.50	0.082	mg/kg	
51-28-5	2,4-Dinitrophenol	ND	1.0	0.13	mg/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	0.50	0.063	mg/kg	
95-48-7	2-Methylphenol	ND	0.50	0.020	mg/kg	
	3&4-Methylphenol	ND	0.50	0.024	mg/kg	
88-75-5	2-Nitrophenol	ND	0.50	0.013	mg/kg	
100-02-7	4-Nitrophenol	ND	1.0	0.094	mg/kg	
87-86-5	Pentachlorophenol	ND	0.50	0.035	mg/kg	
108-95-2	Phenol	ND	0.25	0.014	mg/kg	
95-95-4	2,4,5-Trichlorophenol	ND	0.50	0.013	mg/kg	
88-06-2	2,4,6-Trichlorophenol	ND	0.50	0.012	mg/kg	
62-53-3	Aniline	ND	0.50	0.025	mg/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	0.25	0.013	mg/kg	
85-68-7	Butyl benzyl phthalate	ND	0.25	0.010	mg/kg	
100-51-6	Benzyl Alcohol	ND	0.50	0.025	mg/kg	
91-58-7	2-Chloronaphthalene	ND	0.25	0.014	mg/kg	
106-47-8	4-Chloroaniline	ND	0.50	0.013	mg/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	0.25	0.012	mg/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	0.25	0.015	mg/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	0.25	0.018	mg/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	0.25	0.015	mg/kg	
122-66-7	1,2-Diphenylhydrazine	ND	0.25	0.011	mg/kg	
121-14-2	2,4-Dinitrotoluene	ND	0.50	0.034	mg/kg	
606-20-2	2,6-Dinitrotoluene	ND	0.50	0.013	mg/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	0.25	0.025	mg/kg	
132-64-9	Dibenzofuran	ND	0.10	0.014	mg/kg	
84-74-2	Di-n-butyl phthalate	ND	0.25	0.027	mg/kg	
117-84-0	Di-n-octyl phthalate	ND	0.25	0.0079	mg/kg	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8270D SW846 3546	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

4.1

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	0.25	0.013	mg/kg	
131-11-3	Dimethyl phthalate	ND	0.25	0.015	mg/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	0.25	0.0093	mg/kg	
118-74-1	Hexachlorobenzene	ND	0.25	0.016	mg/kg	
77-47-4	Hexachlorocyclopentadiene	ND	0.50	0.13	mg/kg	UJ
67-72-1	Hexachloroethane	ND	0.25	0.012	mg/kg	
78-59-1	Isophorone	ND	0.25	0.012	mg/kg	
88-74-4	2-Nitroaniline	ND	0.50	0.013	mg/kg	
99-09-2	3-Nitroaniline	ND	0.50	0.028	mg/kg	
100-01-6	4-Nitroaniline	ND	0.50	0.013	mg/kg	
98-95-3	Nitrobenzene	ND	0.25	0.014	mg/kg	
62-75-9	n-Nitrosodimethylamine	ND	0.25	0.012	mg/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	0.25	0.014	mg/kg	
86-30-6	N-Nitrosodiphenylamine	ND	0.25	0.015	mg/kg	
110-86-1	Pyridine	ND	0.50	0.025	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	76%		30-130%
4165-62-2	Phenol-d5	66%		30-130%
118-79-6	2,4,6-Tribromophenol	85%		30-130%
4165-60-0	Nitrobenzene-d5	68%		30-130%
321-60-8	2-Fluorobiphenyl	76%		30-130%
1718-51-0	Terphenyl-d14	82%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
301-02-0	9-Octadecenamide, (Z)-	11.40	.56	mg/kg	JN
	Total TIC, Semi-Volatile		.56	mg/kg	J

ND = Not detected MDL = Method Detection Limit
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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8270D BY SIM SW846 3546	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91330.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403
Run #2							

	Initial Weight	Final Volume
Run #1	20.6 g	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.0050	0.00087	mg/kg	
208-96-8	Acenaphthylene	ND	0.0050	0.00077	mg/kg	
120-12-7	Anthracene	ND	0.0050	0.0011	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.0050	0.0023	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.0050	0.0020	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.0050	0.0022	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.0050	0.0014	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.0050	0.0016	mg/kg	
218-01-9	Chrysene	ND	0.0050	0.0014	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.0050	0.0015	mg/kg	
206-44-0	Fluoranthene	ND	0.0050	0.0015	mg/kg	
86-73-7	Fluorene	ND	0.0050	0.00099	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.0050	0.0012	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.010	0.0011	mg/kg	
91-57-6	2-Methylnaphthalene	0.0012	0.010	0.00094	mg/kg	J
85-01-8	Phenanthrene	ND	0.0050	0.0011	mg/kg	
129-00-0	Pyrene	ND	0.0050	0.0016	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	36%		15-110%
4165-62-2	Phenol-d5	36%		15-110%
118-79-6	2,4,6-Tribromophenol	37%		15-110%
4165-60-0	Nitrobenzene-d5	74%		30-130%
321-60-8	2-Fluorobiphenyl	71%		30-130%
1718-51-0	Terphenyl-d14	98%		30-130%

ND = Not detected MDL = Method Detection Limit
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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8011 SW846 3550B	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BB59391.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318
Run #2							

	Initial Weight	Final Volume
Run #1	30.2 g	50.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.0026	0.00076	mg/kg	
106-93-4	1,2-Dibromoethane	ND	0.0026	0.00063	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	94%		61-167%
460-00-4	Bromofluorobenzene (S)	130%		61-167%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	SVE44-082014(30-36')		
Lab Sample ID:	MC33045-1	Date Sampled:	08/20/14
Matrix:	SO - Soil	Date Received:	08/21/14
Method:	SW846 8015	Percent Solids:	96.6
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX74955.D	1	08/27/14	TB	n/a	n/a	GWX3651
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.26 g	10.0 ml	100 ul
Run #2			

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	2.55	12	1.8	mg/kg	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	100%		61-116%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	N89896.D	1	09/02/14	KD	n/a	n/a	MSN3329
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	3.0	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	92%		70-130%
2037-26-5	Toluene-D8	92%		70-130%
460-00-4	4-Bromofluorobenzene	90%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
67-63-0	Isopropyl Alcohol	6.25	6.9	ug/l	JN
	Total TIC, Volatile		6.9	ug/l	J

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E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8270D SW846 3510C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	F75673.D	1	08/28/14	WK	08/22/14	OP39514	MSF3325
Run #2							

	Initial Volume	Final Volume
Run #1	970 ml	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic Acid	ND	10	2.6	ug/l	
95-57-8	2-Chlorophenol	ND	5.2	0.32	ug/l	
59-50-7	4-Chloro-3-methyl phenol	ND	10	0.85	ug/l	
120-83-2	2,4-Dichlorophenol	ND	10	0.41	ug/l	
105-67-9	2,4-Dimethylphenol	ND	10	0.58	ug/l	
51-28-5	2,4-Dinitrophenol	ND	21	2.6	ug/l	
534-52-1	4,6-Dinitro-o-cresol	ND	10	2.0	ug/l	
95-48-7	2-Methylphenol	ND	10	0.23	ug/l	
	3&4-Methylphenol	ND	10	0.48	ug/l	
88-75-5	2-Nitrophenol	ND	10	3.0	ug/l	
100-02-7	4-Nitrophenol	ND	21	0.55	ug/l	
87-86-5	Pentachlorophenol	ND	10	1.2	ug/l	
108-95-2	Phenol	ND	5.2	0.31	ug/l	
95-95-4	2,4,5-Trichlorophenol	ND	10	0.38	ug/l	
88-06-2	2,4,6-Trichlorophenol	ND	10	0.18	ug/l	
62-53-3	Aniline	ND	10	0.66	ug/l	
101-55-3	4-Bromophenyl phenyl ether	ND	5.2	0.49	ug/l	
85-68-7	Butyl benzyl phthalate	ND	5.2	0.55	ug/l	
100-51-6	Benzyl Alcohol	ND	10	2.3	ug/l	
91-58-7	2-Chloronaphthalene	ND	5.2	0.32	ug/l	
106-47-8	4-Chloroaniline	ND	10	0.57	ug/l	
111-91-1	bis(2-Chloroethoxy)methane	ND	5.2	0.30	ug/l	
111-44-4	bis(2-Chloroethyl)ether	ND	5.2	0.36	ug/l	
108-60-1	bis(2-Chloroisopropyl)ether	ND	5.2	0.34	ug/l	
7005-72-3	4-Chlorophenyl phenyl ether	ND	5.2	0.26	ug/l	
122-66-7	1,2-Diphenylhydrazine	ND	5.2	0.25	ug/l	
121-14-2	2,4-Dinitrotoluene	ND	10	0.47	ug/l	
606-20-2	2,6-Dinitrotoluene	ND	10	0.31	ug/l	
91-94-1	3,3'-Dichlorobenzidine	ND	5.2	0.28	ug/l	
132-64-9	Dibenzofuran	ND	2.1	0.27	ug/l	
84-74-2	Di-n-butyl phthalate	ND	5.2	0.18	ug/l	
117-84-0	Di-n-octyl phthalate	ND	5.2	0.29	ug/l	

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E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8270D SW846 3510C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
84-66-2	Diethyl phthalate	ND	5.2	0.21	ug/l	
131-11-3	Dimethyl phthalate	ND	5.2	0.35	ug/l	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	2.1	0.34	ug/l	
118-74-1	Hexachlorobenzene	ND	5.2	0.30	ug/l	
77-47-4	Hexachlorocyclopentadiene	ND	10	1.3	ug/l	
67-72-1	Hexachloroethane	ND	5.2	0.31	ug/l	
78-59-1	Isophorone	ND	5.2	0.46	ug/l	
88-74-4	2-Nitroaniline	ND	10	0.41	ug/l	
99-09-2	3-Nitroaniline	ND	10	1.4	ug/l	
100-01-6	4-Nitroaniline	ND	10	2.2	ug/l	
98-95-3	Nitrobenzene	ND	5.2	0.40	ug/l	
62-75-9	n-Nitrosodimethylamine	ND	5.2	1.0	ug/l	
621-64-7	N-Nitroso-di-n-propylamine	ND	5.2	0.42	ug/l	
86-30-6	N-Nitrosodiphenylamine	ND	5.2	0.20	ug/l	
110-86-1	Pyridine	ND	10	0.53	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	42%		15-110%
4165-62-2	Phenol-d5	26%		15-110%
118-79-6	2,4,6-Tribromophenol	77%		15-110%
4165-60-0	Nitrobenzene-d5	70%		30-130%
321-60-8	2-Fluorobiphenyl	75%		30-130%
1718-51-0	Terphenyl-d14	83%		30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
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E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8270D BY SIM SW846 3510C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	I91350.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404
Run #2							

	Initial Volume	Final Volume
Run #1	920 ml	1.0 ml
Run #2		

BN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.11	0.075	ug/l	
208-96-8	Acenaphthylene	ND	0.11	0.054	ug/l	
120-12-7	Anthracene	ND	0.11	0.10	ug/l	
56-55-3	Benzo(a)anthracene	ND	0.054	0.021	ug/l	
50-32-8	Benzo(a)pyrene	ND	0.11	0.031	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	0.054	0.034	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	0.11	0.029	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	0.11	0.042	ug/l	
218-01-9	Chrysene	ND	0.11	0.026	ug/l	
53-70-3	Dibenzo(a,h)anthracene	ND	0.11	0.035	ug/l	
206-44-0	Fluoranthene	ND	0.11	0.044	ug/l	
86-73-7	Fluorene	ND	0.11	0.11	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.11	0.033	ug/l	
90-12-0	1-Methylnaphthalene	ND	0.22	0.054	ug/l	
91-57-6	2-Methylnaphthalene	ND	0.22	0.14	ug/l	
85-01-8	Phenanthrene	ND	0.054	0.014	ug/l	
129-00-0	Pyrene	ND	0.11	0.042	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	77%		30-130%
321-60-8	2-Fluorobiphenyl	71%		30-130%
1718-51-0	Terphenyl-d14	100%		30-130%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	YZ91629.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636
Run #2							

	Initial Volume	Final Volume
Run #1	36.2 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0059	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	69%		36-173%
460-00-4	Bromofluorobenzene (S)	76%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQB-082014		
Lab Sample ID:	MC33045-2	Date Sampled:	08/20/14
Matrix:	AQ - Equipment Blank	Date Received:	08/21/14
Method:	SW846 8015	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	AB85646.D	1	08/28/14	AF	n/a	n/a	GAB4558
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	0.10	0.013	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	94%		60-135%

(a) The pH of the sample aliquot for VOA analysis was >2 at time of analysis.

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-082014-HCL		
Lab Sample ID:	MC33045-3	Date Sampled:	08/20/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	N89895.D	1	09/02/14	KD	n/a	n/a	MSN3329
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-082014-HCL		
Lab Sample ID:	MC33045-3	Date Sampled:	08/20/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	1.0	0.47	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-082014-HCL		
Lab Sample ID:	MC33045-3	Date Sampled:	08/20/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/21/14
Method:	SW846 8260C	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

VOA Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	90%		70-130%
2037-26-5	Toluene-D8	93%		70-130%
460-00-4	4-Bromofluorobenzene	89%		70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB-082014-ST		
Lab Sample ID:	MC33045-4	Date Sampled:	08/20/14
Matrix:	AQ - Trip Blank Water	Date Received:	08/21/14
Method:	SW846 8011 SW846 8011	Percent Solids:	n/a
Project:	URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	YZ91630.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636
Run #2							

	Initial Volume	Final Volume
Run #1	36.1 ml	2.0 ml
Run #2		

VOA Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0059	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0059	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	70%		36-173%
460-00-4	Bromofluorobenzene (S)	76%		36-173%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

New England ACCUTEST LABORATORIES

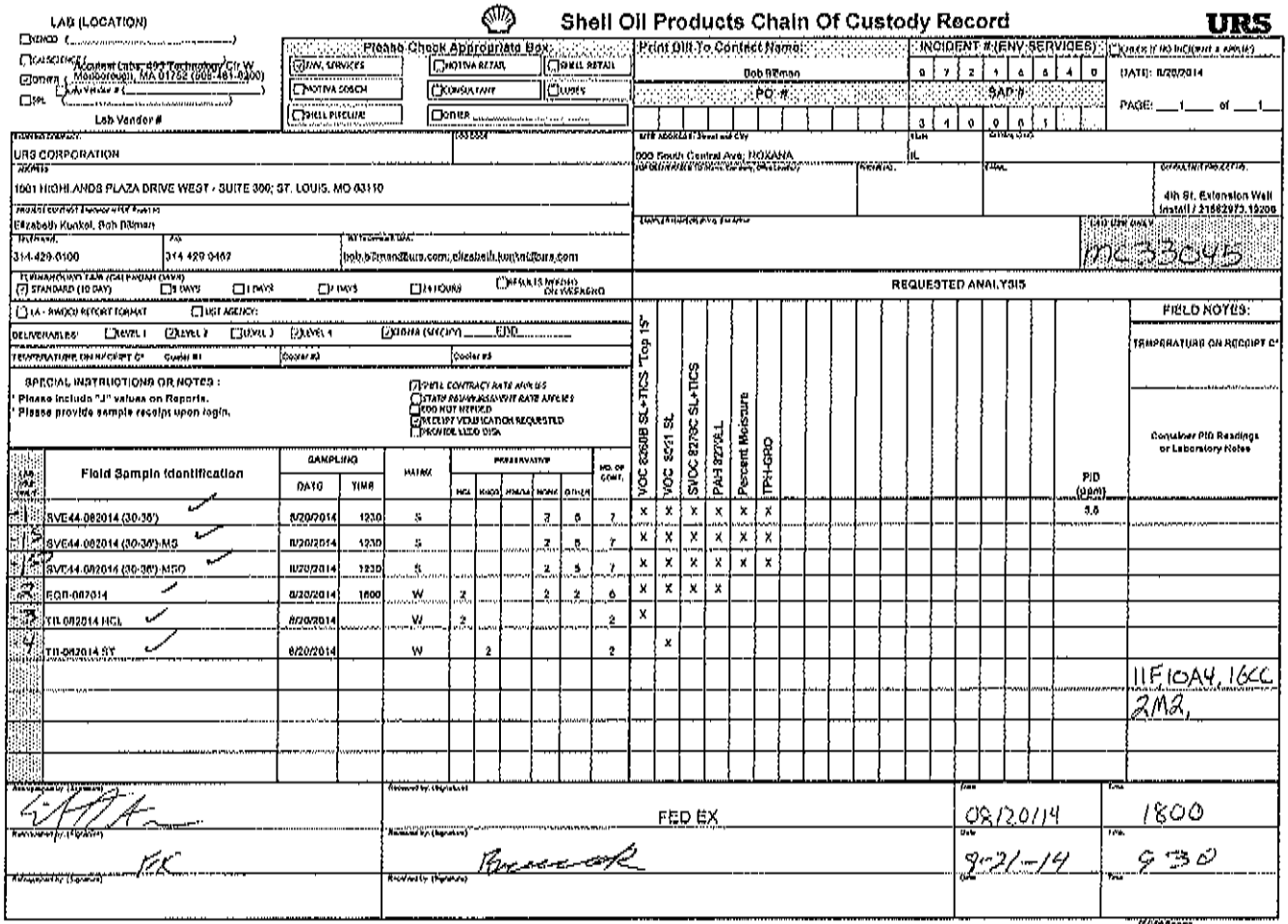
Misc. Forms

5

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Sample Tracking Chronicle
- Internal Chain of Custody



Shell Oil Products Chain Of Custody Record

URS

LAB (LOCATION)
☐ KNOX (.....)
☐ CALSCIENCE (Accutest Labs, 495 Technology Cir W, Marlborough, MA 01752 (508-481-6400))
☑ OTHER (.....)
☐ SPL (.....)
Lab Vendor #

Please Check Appropriate Box:
☑ SVC. SERVICES ☐ MOTIVA RETAIL ☐ SHELL RETAIL
☐ MOTIVA SOSCH ☐ CONSULTANT ☐ USES
☐ SHELL PIPELINE ☐ OTHER

Print O/R To Contact Name: Bob Billman
INCIDENT #:(ENV. SERVICES): 0 7 2 1 4 5 4 0
PO: #
SAP: # 3 1 0 0 0 1
DATE: 8/20/2014
PAGE: 1 of 1

COMPANY: URS CORPORATION
ADDRESS: 1001 HIGHLANDS PLAZA DRIVE WEST - SUITE 300; ST. LOUIS, MO 63110
PROJECT CONTACT (Name/Fax/Phone): Elizabeth Kunkel, Bob Billman
TELEPHONE: 314-429-0100
FAX: 314 429 0462
E-MAIL: bob.billman@urs.com, elizabeth.kunkel@urs.com
SITE ADDRESS (Street and City): 000 South Central Ave; NOXANA
STATE: IL
CONSULTANT/PO #'S: 4th St. Extension Well Install / 21582973.19200
LAB USE ONLY: MC33045

TURNAROUND TIME (CALENDAR DAYS)
(7) STANDARD (10 DAY) ☐ 5 DAYS ☐ 4 DAYS ☐ 3 DAYS ☐ 24 HOURS ☐ RESULTS WITHIN 96 HOURS OR WEEKEND
☐ LA - RWQCB REPORT FORMAT ☐ LIST AGENCY:
DELIVERABLES: ☐ LEVEL 1 ☑ LEVEL 2 ☐ LEVEL 3 ☐ LEVEL 4 ☑ EDF/EDD (SPECIFY) ____EDD____
TEMPERATURE ON RECEIPT C° Cooler #1 Cooler #2 Cooler #3

SPECIAL INSTRUCTIONS OR NOTES:
* Please include "J" values on Reports.
* Please provide sample receipts upon login.
☑ SHELL CONTRACT RATE APPLIES
☐ STATE RWQCB/ASSIST RATE APPLIES
☐ DO NOT REPLICATE
☑ RECEIPT VERIFICATION REQUESTED
☐ PROVIDE LUFT DISK

REQUESTED ANALYSIS

LAB USE ONLY	Field Sample Identification	SAMPLING DATE	SAMPLING TIME	MATRIX	PRESERVATIVE HCL	HNO3	H2SO4	NONE	OTHER	NO. OF CONT.	VOC 8260B SL+TICS "Top 15"	VOC 8021 SL	SVOC 8270C SL+TICS	PAH 8270 LL	Percent Moisture	TPH-GRO	PID (ppm)	FIELD NOTES:
1	SVE44-082014 (30-35')	8/20/2014	1230	S				3	3	7	x	x	x	x	x	x	3.6	
2	SVE44-082014 (30-35')-MS	8/20/2014	1230	S				3	3	7	x	x	x	x	x	x		
3	SVE44-082014 (30-35')-MSD	8/20/2014	1230	S				3	3	7	x	x	x	x	x	x		
4	EQB-082014	8/20/2014	1800	W	3			3	3	9	x	x	x	x				
5	TIL-082014 HCL	8/20/2014		W	2					2	x							
6	TIL-082014 ST	8/20/2014		W		2				2		x						
																		11F10A4, 16CC 2M2,

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
	FED EX	08/20/14	1800
FC		8-21-14	9:30

TEMPERATURE ON RECEIPT C°: Consultant PID Readings or Laboratory Notes

5.1

MC33045: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC33045 Client: URS Immediate Client Services Action Required: No

Date / Time Received: 8/21/2014 Delivery Method: Client Service Action Required at Login: No

Project: 900 SOUTH CENTRAL No. Coolers: 1 Airbill #'s:

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	Infared gun		
3. Cooler media:	Ice (bag)		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☑		☐	☐
2. Trip Blank listed on COC:	☑		☐	☐
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☑		☐	☐

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

5.1

MC33045: Chain of Custody
Page 2 of 2

Internal Sample Tracking Chronicle

Shell Oil

Job No: MC33045

URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Project No: 21562973.19200

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC33045-1 Collected: 20-AUG-14 12:30 By: EA		Received: 21-AUG-14	By: AF			
SVE44-082014(30-36')						
MC33045-1	SM21 2540 B MOD.	22-AUG-14	HS			%SOL
MC33045-1	SW846 8270D BY SIM	22-AUG-14 18:15	WK	21-AUG-14	MEW	B8270SIMSL
MC33045-1	SW846 8260C	25-AUG-14 20:59	KD			V8260SL+
MC33045-1	SW846 8270D	26-AUG-14 00:05	WK	21-AUG-14	MEW	AB8270SL+
MC33045-1	SW846 8015	27-AUG-14 12:44	TB			V8015GRO
MC33045-1	SW846 8011	27-AUG-14 15:31	NK	26-AUG-14	AW	V8011SL
MC33045-2 Collected: 20-AUG-14 16:00 By: EA		Received: 21-AUG-14	By: AF			
EQB-082014						
MC33045-2	SW846 8270D BY SIM	25-AUG-14 11:07	WK	22-AUG-14	PA	B8270SIMSL
MC33045-2	SW846 8015	28-AUG-14 10:38	AF			V8015GRO
MC33045-2	SW846 8270D	28-AUG-14 22:36	WK	22-AUG-14	PA	AB8270SL+
MC33045-2	SW846 8260C	02-SEP-14 14:37	KD			V8260SL+
MC33045-2	SW846 8011	03-SEP-14 20:44	NK	02-SEP-14	MT	V8011SL
MC33045-3 Collected: 20-AUG-14 00:00 By: EA		Received: 21-AUG-14	By: AF			
TB-082014-HCL						
MC33045-3	SW846 8260C	02-SEP-14 14:08	KD			V8260SL+
MC33045-4 Collected: 20-AUG-14 00:00 By: EA		Received: 21-AUG-14	By: AF			
TB-082014-ST						
MC33045-4	SW846 8011	03-SEP-14 21:03	NK	02-SEP-14	MT	V8011SL

Accutest Internal Chain of Custody

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/21/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC33045-1.1	Walk In Ref #9	Hamid Siamak	08/22/14 09:46	Retrieve from Storage
MC33045-1.1	Hamid Siamak	Walk In Ref #9	08/22/14 11:03	Return to Storage
MC33045-1.2	Walk In Ref #9	Aysia Wood	08/21/14 14:27	Retrieve from Storage
MC33045-1.2	Aysia Wood	Walk In Ref #9	08/21/14 21:05	Return to Storage
MC33045-1.3	Walk In Ref #9	Nicole Estey	08/26/14 14:26	Retrieve from Storage
MC33045-1.3	Nicole Estey	Walk In Ref #9	08/26/14 20:03	Return to Storage
MC33045-1.7	VOC Ref #10	Krysten Dufort	08/25/14 14:51	Retrieve from Storage
MC33045-1.7	Krysten Dufort	GCMSM	08/25/14 14:51	Load on Instrument
MC33045-1.7	GCMSM	Krysten Dufort	08/26/14 09:27	Unload from Instrument
MC33045-1.7	Krysten Dufort	VOC Ref #10	08/26/14 09:27	Return to Storage
MC33045-1.11	VOC Ref #10	Krysten Dufort	08/25/14 14:51	Retrieve from Storage
MC33045-1.11	Krysten Dufort	GCMSM	08/25/14 14:51	Load on Instrument
MC33045-1.11	GCMSM	Krysten Dufort	08/26/14 09:27	Unload from Instrument
MC33045-1.11	Krysten Dufort	VOC Ref #10	08/26/14 09:27	Return to Storage
MC33045-1.12	VOC Ref #10	Krysten Dufort	08/25/14 14:51	Retrieve from Storage
MC33045-1.12	Krysten Dufort	GCMSM	08/25/14 14:51	Load on Instrument
MC33045-1.12	GCMSM	Krysten Dufort	08/26/14 09:27	Unload from Instrument
MC33045-1.12	Krysten Dufort	VOC Ref #10	08/26/14 09:27	Return to Storage
MC33045-1.19	VOC Ref #10	Todd Bahosh	08/27/14 10:57	Retrieve from Storage
MC33045-1.19	Todd Bahosh	GCWX	08/27/14 10:57	Load on Instrument
MC33045-1.19	GCWX	Todd Bahosh	08/28/14 10:58	Unload from Instrument
MC33045-1.19	Todd Bahosh	VOC Ref #10	08/28/14 10:58	Return to Storage
MC33045-1.20	VOC Ref #10	Jaime Maslowski	08/21/14 14:54	Retrieve from Storage
MC33045-1.20	Jaime Maslowski	VOC Ref #10	08/22/14 10:18	Return to Storage
MC33045-2.2	Walk In Ref #22	Alireza Zeighami	08/22/14 07:41	Retrieve from Storage
MC33045-2.2	Alireza Zeighami		08/23/14 15:26	Depleted
MC33045-2.4	VOC Ref #2	Krysten Dufort	09/02/14 12:30	Retrieve from Storage
MC33045-2.4	Krysten Dufort	GCMSN	09/02/14 12:30	Load on Instrument
MC33045-2.4	GCMSN	Krysten Dufort	09/03/14 10:19	Unload from Instrument
MC33045-2.4	Krysten Dufort	VOC Ref #2	09/03/14 10:19	Return to Storage
MC33045-2.5	VOC Ref #2	Marc Tahtamoni	09/02/14 14:46	Retrieve from Storage
MC33045-2.6	VOC Ref #2	Anthony Franciosa	08/28/14 08:51	Retrieve from Storage
MC33045-2.6	Anthony Franciosa	GCAB	08/28/14 08:51	Load on Instrument

5.3

Accutest Internal Chain of Custody

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL
Received: 08/21/14

Sample.Bottle Number	Transfer FROM	Transfer TO	Date/Time	Reason
MC33045-2.6	GCAB	Anthony Franciosa	08/29/14 07:58	Unload from Instrument
MC33045-2.6	Anthony Franciosa	VOC Ref #2	08/29/14 07:58	Return to Storage
MC33045-3.1	VOC Ref #2	Krysten Dufort	09/02/14 12:30	Retrieve from Storage
MC33045-3.1	Krysten Dufort	GCMSN	09/02/14 12:30	Load on Instrument
MC33045-3.1	GCMSN	Krysten Dufort	09/03/14 10:19	Unload from Instrument
MC33045-3.1	Krysten Dufort	VOC Ref #2	09/03/14 10:19	Return to Storage
MC33045-4.2	VOC Ref #2	Marc Tahtamoni	09/02/14 14:46	Retrieve from Storage

5.3

New England ACCUTEST LABORATORIES

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-MB	M67790.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.8	ug/kg	
107-02-8	Acrolein	ND	25	8.8	ug/kg	
107-13-1	Acrylonitrile	ND	25	2.7	ug/kg	
71-43-2	Benzene	ND	0.50	0.34	ug/kg	
108-86-1	Bromobenzene	ND	5.0	0.25	ug/kg	
74-97-5	Bromochloromethane	ND	5.0	0.35	ug/kg	
75-27-4	Bromodichloromethane	ND	2.0	0.21	ug/kg	
75-25-2	Bromoform	ND	2.0	0.35	ug/kg	
74-83-9	Bromomethane	ND	2.0	0.60	ug/kg	
78-93-3	2-Butanone (MEK)	ND	10	3.1	ug/kg	
104-51-8	n-Butylbenzene	ND	5.0	0.24	ug/kg	
135-98-8	sec-Butylbenzene	ND	5.0	0.75	ug/kg	
98-06-6	tert-Butylbenzene	ND	5.0	0.21	ug/kg	
75-15-0	Carbon disulfide	ND	5.0	0.13	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.0	0.22	ug/kg	
108-90-7	Chlorobenzene	ND	2.0	0.16	ug/kg	
75-00-3	Chloroethane	ND	5.0	0.76	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	1.3	ug/kg	
67-66-3	Chloroform	ND	2.0	0.17	ug/kg	
74-87-3	Chloromethane	ND	5.0	0.56	ug/kg	
95-49-8	o-Chlorotoluene	ND	5.0	0.19	ug/kg	
106-43-4	p-Chlorotoluene	ND	5.0	0.27	ug/kg	
124-48-1	Dibromochloromethane	ND	2.0	0.32	ug/kg	
95-50-1	1,2-Dichlorobenzene	ND	2.0	0.21	ug/kg	
541-73-1	1,3-Dichlorobenzene	ND	2.0	0.30	ug/kg	
106-46-7	1,4-Dichlorobenzene	ND	2.0	0.35	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.81	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.0	0.27	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.0	0.32	ug/kg	
75-35-4	1,1-Dichloroethene	ND	2.0	0.41	ug/kg	
156-59-2	cis-1,2-Dichloroethene	ND	2.0	0.45	ug/kg	
156-60-5	trans-1,2-Dichloroethene	ND	2.0	0.42	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.0	0.42	ug/kg	
142-28-9	1,3-Dichloropropane	ND	5.0	0.33	ug/kg	
594-20-7	2,2-Dichloropropane	ND	5.0	0.56	ug/kg	
563-58-6	1,1-Dichloropropene	ND	5.0	0.26	ug/kg	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-MB	M67790.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	2.0	0.23	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.0	0.26	ug/kg	
123-91-1	1,4-Dioxane	ND	25	20	ug/kg	
97-63-2	Ethyl methacrylate	ND	5.0	0.36	ug/kg	
100-41-4	Ethylbenzene	ND	2.0	0.69	ug/kg	
87-68-3	Hexachlorobutadiene	ND	5.0	0.57	ug/kg	
591-78-6	2-Hexanone	ND	10	0.76	ug/kg	
98-82-8	Isopropylbenzene	ND	5.0	0.17	ug/kg	
99-87-6	p-Isopropyltoluene	ND	5.0	0.17	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.0	0.18	ug/kg	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.54	ug/kg	
74-95-3	Methylene bromide	ND	5.0	0.46	ug/kg	
75-09-2	Methylene chloride	ND	2.0	0.53	ug/kg	
91-20-3	Naphthalene	ND	5.0	0.40	ug/kg	
103-65-1	n-Propylbenzene	ND	5.0	0.15	ug/kg	
100-42-5	Styrene	ND	5.0	0.17	ug/kg	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	0.40	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.0	0.39	ug/kg	
127-18-4	Tetrachloroethene	ND	2.0	0.31	ug/kg	
108-88-3	Toluene	ND	5.0	0.21	ug/kg	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.43	ug/kg	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.51	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.0	0.22	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.0	0.57	ug/kg	
79-01-6	Trichloroethene	ND	2.0	0.24	ug/kg	
75-69-4	Trichlorofluoromethane	ND	2.0	0.40	ug/kg	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.29	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	1.4	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	1.5	ug/kg	
108-05-4	Vinyl Acetate	ND	5.0	1.5	ug/kg	
75-01-4	Vinyl chloride	ND	2.0	0.91	ug/kg	
	m,p-Xylene	ND	2.0	0.44	ug/kg	
95-47-6	o-Xylene	ND	2.0	0.28	ug/kg	
1330-20-7	Xylene (total)	ND	2.0	0.22	ug/kg	

6.1.1

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-MB	M67790.D	1	08/25/14	KD	n/a	n/a	MSM2398

6.1.1

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	90%	70-130%
2037-26-5	Toluene-D8	89%	70-130%
460-00-4	4-Bromofluorobenzene	83%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/kg	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-MB	N89890.D	1	09/02/14	KD	n/a	n/a	MSN3329

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	ND	10	2.5	ug/l	
107-02-8	Acrolein	ND	25	6.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	2.1	ug/l	
71-43-2	Benzene	ND	0.50	0.32	ug/l	
108-86-1	Bromobenzene	ND	5.0	0.35	ug/l	
74-97-5	Bromochloromethane	ND	5.0	0.57	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	0.34	ug/l	
75-25-2	Bromoform	ND	1.0	0.61	ug/l	
74-83-9	Bromomethane	ND	2.0	1.8	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	2.5	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	1.1	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.42	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.39	ug/l	
75-15-0	Carbon disulfide	ND	5.0	0.46	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	0.53	ug/l	
108-90-7	Chlorobenzene	ND	1.0	0.43	ug/l	
75-00-3	Chloroethane	ND	2.0	0.53	ug/l	
110-75-8	2-Chloroethyl vinyl ether	ND	5.0	3.3	ug/l	
67-66-3	Chloroform	ND	1.0	0.41	ug/l	
74-87-3	Chloromethane	ND	2.0	1.1	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	0.38	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	0.45	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	0.38	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	0.32	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	0.56	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	0.36	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	0.71	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	0.36	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.50	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	0.61	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	0.84	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	0.51	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.50	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	0.89	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	1.3	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	0.47	ug/l	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-MB	N89890.D	1	09/02/14	KD	n/a	n/a	MSN3329

6.1.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Compound	Result	RL	MDL	Units	Q
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	0.42	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	0.50	ug/l	
123-91-1	1,4-Dioxane	ND	25	11	ug/l	
97-63-2	Ethyl methacrylate	ND	5.0	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.38	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	1.7	ug/l	
591-78-6	2-Hexanone	ND	5.0	1.6	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	0.35	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	0.37	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.51	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	0.99	ug/l	
74-95-3	Methylene bromide	ND	5.0	0.52	ug/l	
75-09-2	Methylene chloride	ND	2.0	0.28	ug/l	
91-20-3	Naphthalene	ND	5.0	0.69	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	0.49	ug/l	
100-42-5	Styrene	ND	5.0	0.85	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	0.43	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	0.40	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	0.59	ug/l	
108-88-3	Toluene	ND	1.0	0.33	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	0.68	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	0.50	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	0.46	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	0.45	ug/l	
79-01-6	Trichloroethene	ND	0.40	0.40	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	0.55	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	0.81	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	0.32	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	0.38	ug/l	
108-05-4	Vinyl Acetate	ND	5.0	0.71	ug/l	
75-01-4	Vinyl chloride	ND	1.0	0.58	ug/l	
	m,p-Xylene	ND	1.0	0.93	ug/l	
95-47-6	o-Xylene	ND	1.0	0.36	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.36	ug/l	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-MB	N89890.D	1	09/02/14	KD	n/a	n/a	MSN3329

6.1.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	88%	70-130%
2037-26-5	Toluene-D8	91%	70-130%
460-00-4	4-Bromofluorobenzene	89%	70-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Volatile		0	ug/l	

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-BS	M67787.D	1	08/25/14	KD	n/a	n/a	MSM2398
MSM2398-BSD	M67788.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	50	53.2	106	54.4	109	2	70-130/25
107-02-8	Acrolein	250	205	82	154	62* a	28* a	70-130/25
107-13-1	Acrylonitrile	50	48.5	97	49.3	99	2	70-130/25
71-43-2	Benzene	50	44.7	89	51.8	104	15	70-130/25
108-86-1	Bromobenzene	50	46.5	93	53.8	108	15	70-130/25
74-97-5	Bromochloromethane	50	48.8	98	55.7	111	13	70-130/25
75-27-4	Bromodichloromethane	50	49.0	98	58.2	116	17	70-130/25
75-25-2	Bromoform	50	50.0	100	53.0	106	6	70-130/25
74-83-9	Bromomethane	50	49.9	100	39.7	79	23	70-130/25
78-93-3	2-Butanone (MEK)	50	50.7	101	50.2	100	1	70-130/25
104-51-8	n-Butylbenzene	50	43.4	87	49.9	100	14	70-130/25
135-98-8	sec-Butylbenzene	50	43.7	87	51.3	103	16	70-130/25
98-06-6	tert-Butylbenzene	50	43.9	88	51.9	104	17	70-130/25
75-15-0	Carbon disulfide	50	42.7	85	49.1	98	14	70-130/25
56-23-5	Carbon tetrachloride	50	46.0	92	52.8	106	14	70-130/25
108-90-7	Chlorobenzene	50	45.6	91	53.1	106	15	70-130/25
75-00-3	Chloroethane	50	55.2	110	45.3	91	20	70-130/25
110-75-8	2-Chloroethyl vinyl ether	50	58.6	117	46.6	93	23	10-160/25
67-66-3	Chloroform	50	46.0	92	53.6	107	15	70-130/25
74-87-3	Chloromethane	50	42.1	84	33.2	66* a	24	70-130/25
95-49-8	o-Chlorotoluene	50	45.2	90	51.4	103	13	70-130/25
106-43-4	p-Chlorotoluene	50	45.1	90	51.0	102	12	70-130/25
124-48-1	Dibromochloromethane	50	47.7	95	53.7	107	12	70-130/25
95-50-1	1,2-Dichlorobenzene	50	47.7	95	54.8	110	14	70-130/25
541-73-1	1,3-Dichlorobenzene	50	45.8	92	53.2	106	15	70-130/25
106-46-7	1,4-Dichlorobenzene	50	45.7	91	52.9	106	15	70-130/25
75-71-8	Dichlorodifluoromethane	50	30.1	60* a	23.1	46* a	26* a	70-130/25
75-34-3	1,1-Dichloroethane	50	45.7	91	53.2	106	15	70-130/25
107-06-2	1,2-Dichloroethane	50	46.9	94	55.2	110	16	70-130/25
75-35-4	1,1-Dichloroethene	50	43.2	86	50.3	101	15	70-130/25
156-59-2	cis-1,2-Dichloroethene	50	45.2	90	52.0	104	14	70-130/25
156-60-5	trans-1,2-Dichloroethene	50	43.4	87	50.4	101	15	70-130/25
78-87-5	1,2-Dichloropropane	50	44.7	89	53.3	107	18	70-130/25
142-28-9	1,3-Dichloropropane	50	45.0	90	50.6	101	12	70-130/25
594-20-7	2,2-Dichloropropane	50	46.5	93	53.7	107	14	70-130/25
563-58-6	1,1-Dichloropropene	50	40.5	81	49.2	98	19	70-130/25

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-BS	M67787.D	1	08/25/14	KD	n/a	n/a	MSM2398
MSM2398-BSD	M67788.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	50	46.1	92	54.9	110	17	70-130/25
10061-02-6	trans-1,3-Dichloropropene	50	50.9	102	60.0	120	16	70-130/25
123-91-1	1,4-Dioxane	125	125	100	138	110	10	70-130/25
97-63-2	Ethyl methacrylate	50	48.8	98	54.4	109	11	76-141/25
100-41-4	Ethylbenzene	50	43.7	87	50.7	101	15	70-130/25
87-68-3	Hexachlorobutadiene	50	42.4	85	48.7	97	14	70-130/25
591-78-6	2-Hexanone	50	43.7	87	45.2	90	3	70-130/25
98-82-8	Isopropylbenzene	50	45.4	91	55.3	111	20	70-130/25
99-87-6	p-Isopropyltoluene	50	43.7	87	51.6	103	17	70-130/25
1634-04-4	Methyl Tert Butyl Ether	50	47.9	96	53.3	107	11	70-130/25
108-10-1	4-Methyl-2-pentanone (MIBK)	50	46.5	93	49.4	99	6	70-130/25
74-95-3	Methylene bromide	50	47.1	94	53.9	108	13	70-130/25
75-09-2	Methylene chloride	50	44.8	90	50.4	101	12	70-130/25
91-20-3	Naphthalene	50	50.3	101	54.8	110	9	70-130/25
103-65-1	n-Propylbenzene	50	44.1	88	51.5	103	15	70-130/25
100-42-5	Styrene	50	47.9	96	54.7	109	13	70-130/25
630-20-6	1,1,1,2-Tetrachloroethane	50	45.5	91	54.8	110	19	70-130/25
79-34-5	1,1,2,2-Tetrachloroethane	50	47.9	96	52.0	104	8	70-130/25
127-18-4	Tetrachloroethene	50	42.3	85	50.4	101	17	70-130/25
108-88-3	Toluene	50	44.3	89	53.7	107	19	70-130/25
87-61-6	1,2,3-Trichlorobenzene	50	48.1	96	55.4	111	14	70-130/25
120-82-1	1,2,4-Trichlorobenzene	50	47.4	95	54.5	109	14	70-130/25
71-55-6	1,1,1-Trichloroethane	50	45.3	91	53.2	106	16	70-130/25
79-00-5	1,1,2-Trichloroethane	50	46.9	94	55.0	110	16	70-130/25
79-01-6	Trichloroethene	50	43.0	86	51.6	103	18	70-130/25
75-69-4	Trichlorofluoromethane	50	46.7	93	36.8	74	24	70-130/25
96-18-4	1,2,3-Trichloropropane	50	46.8	94	51.4	103	9	70-130/25
95-63-6	1,2,4-Trimethylbenzene	50	45.7	91	53.7	107	16	70-130/25
108-67-8	1,3,5-Trimethylbenzene	50	44.0	88	50.2	100	13	70-130/25
108-05-4	Vinyl Acetate	50	37.0	74	39.8	80	7	70-130/25
75-01-4	Vinyl chloride	50	45.6	91	35.3	71	25	70-130/25
	m,p-Xylene	100	87.5	88	104	104	17	70-130/25
95-47-6	o-Xylene	50	45.7	91	54.6	109	18	70-130/25
1330-20-7	Xylene (total)	150	133	89	159	106	18	70-130/25

* = Outside of Control Limits.

6.2.1

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSM2398-BS	M67787.D	1	08/25/14	KD	n/a	n/a	MSM2398
MSM2398-BSD	M67788.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
1868-53-7	Dibromofluoromethane	91%	90%	70-130%
2037-26-5	Toluene-D8	86%	88%	70-130%
460-00-4	4-Bromofluorobenzene	87%	85%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

6.2.1

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-BS	N89887.D	1	09/02/14	KD	n/a	n/a	MSN3329
MSN3329-BSD	N89888.D	1	09/02/14	KD	n/a	n/a	MSN3329

6.2.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	50	34.9	70	32.5	65* a	7	70-130/25
107-02-8	Acrolein	250	250	100	251	100	0	70-130/25
107-13-1	Acrylonitrile	50	48.9	98	48.8	98	0	70-130/25
71-43-2	Benzene	50	43.4	87	44.9	90	3	70-130/25
108-86-1	Bromobenzene	50	45.0	90	46.1	92	2	70-130/25
74-97-5	Bromochloromethane	50	46.9	94	46.9	94	0	70-130/25
75-27-4	Bromodichloromethane	50	48.1	96	49.1	98	2	70-130/25
75-25-2	Bromoform	50	46.8	94	49.6	99	6	70-130/25
74-83-9	Bromomethane	50	33.8	68* a	35.4	71	5	70-130/25
78-93-3	2-Butanone (MEK)	50	38.6	77	41.0	82	6	70-130/25
104-51-8	n-Butylbenzene	50	48.2	96	49.3	99	2	70-130/25
135-98-8	sec-Butylbenzene	50	44.9	90	45.3	91	1	70-130/25
98-06-6	tert-Butylbenzene	50	43.9	88	44.4	89	1	70-130/25
75-15-0	Carbon disulfide	50	48.5	97	49.4	99	2	70-130/25
56-23-5	Carbon tetrachloride	50	49.7	99	49.8	100	0	70-130/25
108-90-7	Chlorobenzene	50	43.0	86	45.4	91	5	70-130/25
75-00-3	Chloroethane	50	47.8	96	49.8	100	4	70-130/25
110-75-8	2-Chloroethyl vinyl ether	50	45.8	92	46.4	93	1	70-130/25
67-66-3	Chloroform	50	42.7	85	42.9	86	0	70-130/25
74-87-3	Chloromethane	50	39.6	79	40.8	82	3	70-130/25
95-49-8	o-Chlorotoluene	50	44.6	89	44.5	89	0	70-130/25
106-43-4	p-Chlorotoluene	50	44.9	90	45.3	91	1	70-130/25
124-48-1	Dibromochloromethane	50	48.9	98	51.2	102	5	70-130/25
95-50-1	1,2-Dichlorobenzene	50	48.0	96	47.6	95	1	70-130/25
541-73-1	1,3-Dichlorobenzene	50	45.1	90	45.2	90	0	70-130/25
106-46-7	1,4-Dichlorobenzene	50	45.1	90	46.1	92	2	70-130/25
75-71-8	Dichlorodifluoromethane	50	37.6	75	37.2	74	1	70-130/25
75-34-3	1,1-Dichloroethane	50	46.3	93	46.5	93	0	70-130/25
107-06-2	1,2-Dichloroethane	50	44.4	89	44.2	88	0	70-130/25
75-35-4	1,1-Dichloroethene	50	46.1	92	46.7	93	1	70-130/25
156-59-2	cis-1,2-Dichloroethene	50	42.7	85	43.4	87	2	70-130/25
156-60-5	trans-1,2-Dichloroethene	50	44.2	88	44.9	90	2	70-130/25
78-87-5	1,2-Dichloropropane	50	46.6	93	47.2	94	1	70-130/25
142-28-9	1,3-Dichloropropane	50	43.3	87	45.1	90	4	70-130/25
594-20-7	2,2-Dichloropropane	50	54.8	110	54.6	109	0	70-130/25
563-58-6	1,1-Dichloropropene	50	44.8	90	45.0	90	0	70-130/25

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-BS	N89887.D	1	09/02/14	KD	n/a	n/a	MSN3329
MSN3329-BSD	N89888.D	1	09/02/14	KD	n/a	n/a	MSN3329

6.2.2

6

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	50	46.8	94	47.9	96	2	70-130/25
10061-02-6	trans-1,3-Dichloropropene	50	54.1	108	55.6	111	3	70-130/25
123-91-1	1,4-Dioxane	125	146	117	128	102	13	70-130/25
97-63-2	Ethyl methacrylate	50	51.2	102	53.2	106	4	77-137/25
100-41-4	Ethylbenzene	50	42.9	86	44.7	89	4	70-130/25
87-68-3	Hexachlorobutadiene	50	41.8	84	42.9	86	3	70-130/25
591-78-6	2-Hexanone	50	32.0	64* a	33.0	66* a	3	70-130/25
98-82-8	Isopropylbenzene	50	45.6	91	45.4	91	0	70-130/25
99-87-6	p-Isopropyltoluene	50	45.9	92	46.8	94	2	70-130/25
1634-04-4	Methyl Tert Butyl Ether	50	51.5	103	53.3	107	3	70-130/25
108-10-1	4-Methyl-2-pentanone (MIBK)	50	44.4	89	45.5	91	2	70-130/25
74-95-3	Methylene bromide	50	46.1	92	47.1	94	2	70-130/25
75-09-2	Methylene chloride	50	42.6	85	43.4	87	2	70-130/25
91-20-3	Naphthalene	50	49.6	99	54.7	109	10	70-130/25
103-65-1	n-Propylbenzene	50	45.6	91	46.0	92	1	70-130/25
100-42-5	Styrene	50	45.1	90	47.5	95	5	70-130/25
630-20-6	1,1,1,2-Tetrachloroethane	50	43.1	86	45.2	90	5	70-130/25
79-34-5	1,1,2,2-Tetrachloroethane	50	46.4	93	47.7	95	3	70-130/25
127-18-4	Tetrachloroethene	50	43.8	88	46.0	92	5	70-130/25
108-88-3	Toluene	50	45.2	90	45.8	92	1	70-130/25
87-61-6	1,2,3-Trichlorobenzene	50	47.0	94	50.4	101	7	70-130/25
120-82-1	1,2,4-Trichlorobenzene	50	45.4	91	47.1	94	4	70-130/25
71-55-6	1,1,1-Trichloroethane	50	45.1	90	45.3	91	0	70-130/25
79-00-5	1,1,2-Trichloroethane	50	45.1	90	46.7	93	3	70-130/25
79-01-6	Trichloroethene	50	41.0	82	38.6	77	6	70-130/25
75-69-4	Trichlorofluoromethane	50	42.0	84	40.7	81	3	70-130/25
96-18-4	1,2,3-Trichloropropane	50	48.9	98	49.7	99	2	70-130/25
95-63-6	1,2,4-Trimethylbenzene	50	45.7	91	45.9	92	0	70-130/25
108-67-8	1,3,5-Trimethylbenzene	50	43.2	86	43.1	86	0	70-130/25
108-05-4	Vinyl Acetate	50	43.7	87	45.5	91	4	70-130/25
75-01-4	Vinyl chloride	50	36.5	73	36.4	73	0	70-130/25
	m,p-Xylene	100	85.1	85	89.0	89	4	70-130/25
95-47-6	o-Xylene	50	42.8	86	44.9	90	5	70-130/25
1330-20-7	Xylene (total)	150	128	85	134	89	5	70-130/25

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSN3329-BS	N89887.D	1	09/02/14	KD	n/a	n/a	MSN3329
MSN3329-BSD	N89888.D	1	09/02/14	KD	n/a	n/a	MSN3329

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
1868-53-7	Dibromofluoromethane	90%	88%	70-130%
2037-26-5	Toluene-D8	92%	92%	70-130%
460-00-4	4-Bromofluorobenzene	86%	84%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

6.2.2

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33045-1MS	M67805.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1MSD	M67806.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1	M67804.D	1	08/25/14	KD	n/a	n/a	MSM2398

6.3.1

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		57	33.0	58* a	59.1	30.9	52* a	7	70-130/30
107-02-8	Acrolein	ND		285	128	45* a	295	115	39* a	11	70-130/30
107-13-1	Acrylonitrile	ND		57	59.5	104	59.1	57.2	97	4	70-130/30
71-43-2	Benzene	0.85		57	48.4	83	59.1	47.3	79	2	70-130/30
108-86-1	Bromobenzene	ND		57	43.3	76	59.1	43.8	74	1	70-130/30
74-97-5	Bromochloromethane	ND		57	55.1	97	59.1	55.4	94	1	70-130/30
75-27-4	Bromodichloromethane	ND		57	53.5	94	59.1	54.0	91	1	70-130/30
75-25-2	Bromoform	ND		57	52.0	91	59.1	53.2	90	2	70-130/30
74-83-9	Bromomethane	ND		57	46.4	81	59.1	40.8	69* a	13	70-130/30
78-93-3	2-Butanone (MEK)	ND		57	42.9	75	59.1	45.0	76	5	70-130/30
104-51-8	n-Butylbenzene	ND		57	33.6	59* a	59.1	37.3	63* a	10	70-130/30
135-98-8	sec-Butylbenzene	ND		57	36.0	63* a	59.1	39.7	67* a	10	70-130/30
98-06-6	tert-Butylbenzene	ND		57	36.9	65* a	59.1	40.4	68* a	9	70-130/30
75-15-0	Carbon disulfide	ND		57	51.6	91	59.1	46.9	79	10	70-130/30
56-23-5	Carbon tetrachloride	ND		57	51.8	91	59.1	47.3	80	9	70-130/30
108-90-7	Chlorobenzene	ND		57	45.1	79	59.1	45.0	76	0	70-130/30
75-00-3	Chloroethane	ND		57	53.3	94	59.1	47.2	80	12	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		57	ND	0* a	59.1	ND	0* a	nc	10-160/30
67-66-3	Chloroform	ND		57	51.3	90	59.1	51.1	86	0	70-130/30
74-87-3	Chloromethane	ND		57	42.2	74	59.1	36.3	61* a	15	70-130/30
95-49-8	o-Chlorotoluene	ND		57	38.8	68* a	59.1	41.0	69* a	6	70-130/30
106-43-4	p-Chlorotoluene	ND		57	38.4	67* a	59.1	39.7	67* a	3	70-130/30
124-48-1	Dibromochloromethane	ND		57	49.8	87	59.1	51.4	87	3	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		57	41.0	72	59.1	43.1	73	5	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		57	38.8	68* a	59.1	40.8	69* a	5	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		57	38.8	68* a	59.1	40.1	68* a	3	70-130/30
75-71-8	Dichlorodifluoromethane	ND		57	27.9	49* a	59.1	23.9	40* a	15	70-130/30
75-34-3	1,1-Dichloroethane	ND		57	52.1	91	59.1	51.2	87	2	70-130/30
107-06-2	1,2-Dichloroethane	ND		57	53.5	94	59.1	53.0	90	1	70-130/30
75-35-4	1,1-Dichloroethene	ND		57	52.6	92	59.1	48.0	81	9	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		57	50.2	88	59.1	49.8	84	1	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		57	49.8	87	59.1	47.2	80	5	70-130/30
78-87-5	1,2-Dichloropropane	ND		57	49.4	87	59.1	49.1	83	1	70-130/30
142-28-9	1,3-Dichloropropane	ND		57	48.8	86	59.1	49.8	84	2	70-130/30
594-20-7	2,2-Dichloropropane	ND		57	50.2	88	59.1	49.2	83	2	70-130/30
563-58-6	1,1-Dichloropropene	ND		57	46.9	82	59.1	43.9	74	7	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33045-1MS	M67805.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1MSD	M67806.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1	M67804.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		57	49.0	86	59.1	48.8	83	0	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		57	55.1	97	59.1	54.6	92	1	70-130/30
123-91-1	1,4-Dioxane	ND		143	156	109	148	168	114	7	70-130/30
97-63-2	Ethyl methacrylate	ND		57	54.3	95	59.1	58.8	100	8	41-160/30
100-41-4	Ethylbenzene	1.6	J	57	43.7	74	59.1	44.5	73	2	70-130/30
87-68-3	Hexachlorobutadiene	ND		57	29.3	51* a	59.1	33.4	57* a	13	70-130/30
591-78-6	2-Hexanone	ND		57	38.3	67* a	59.1	44.9	76	16	70-130/30
98-82-8	Isopropylbenzene	ND		57	40.7	71	59.1	43.1	73	6	70-130/30
99-87-6	p-Isopropyltoluene	ND		57	35.5	62* a	59.1	39.2	66* a	10	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		57	51.1	90	59.1	56.3	95	10	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		57	58.8	103	59.1	61.9	105	5	70-130/30
74-95-3	Methylene bromide	ND		57	52.9	93	59.1	53.3	90	1	70-130/30
75-09-2	Methylene chloride	ND		57	49.8	87	59.1	48.1	81	3	70-130/30
91-20-3	Naphthalene	ND		57	45.2	79	59.1	49.8	84	10	70-130/30
103-65-1	n-Propylbenzene	ND		57	38.7	68* a	59.1	41.1	70	6	70-130/30
100-42-5	Styrene	ND		57	43.5	76	59.1	44.1	75	1	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		57	46.0	81	59.1	46.4	79	1	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		57	51.0	89	59.1	52.2	88	2	70-130/30
127-18-4	Tetrachloroethene	ND		57	41.4	73	59.1	41.7	71	1	70-130/30
108-88-3	Toluene	2.2	J	57	50.4	85	59.1	48.8	79	3	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		57	32.9	58* a	59.1	38.0	64* a	14	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		57	30.7	54* a	59.1	34.6	59* a	12	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		57	53.4	94	59.1	50.5	85	6	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		57	54.8	96	59.1	55.0	93	0	70-130/30
79-01-6	Trichloroethene	ND		57	47.5	83	59.1	45.1	76	5	70-130/30
75-69-4	Trichlorofluoromethane	ND		57	43.7	77	59.1	39.4	67* a	10	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		57	50.8	89	59.1	52.6	89	3	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		57	38.6	68* a	59.1	42.2	71	9	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		57	36.3	64* a	59.1	39.3	67* a	8	70-130/30
108-05-4	Vinyl Acetate	ND		57	26.1	46* a	59.1	27.3	46* a	4	70-130/30
75-01-4	Vinyl chloride	ND		57	43.4	76	59.1	38.3	65* a	12	70-130/30
	m,p-Xylene	0.77	J	114	86.7	75	118	87.6	73	1	70-130/30
95-47-6	o-Xylene	ND		57	45.0	79	59.1	45.3	77	1	70-130/30
1330-20-7	Xylene (total)	1.1	J	171	132	77	177	133	74	1	70-130/30

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33045-1MS	M67805.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1MSD	M67806.D	1	08/25/14	KD	n/a	n/a	MSM2398
MC33045-1	M67804.D	1	08/25/14	KD	n/a	n/a	MSM2398

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-1

CAS No.	Surrogate Recoveries	MS	MSD	MC33045-1	Limits
1868-53-7	Dibromofluoromethane	102%	102%	102%	70-130%
2037-26-5	Toluene-D8	90%	89%	90%	70-130%
460-00-4	4-Bromofluorobenzene	84%	85%	84%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

6.3.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33209-3MS	N89911.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3MSD	N89912.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3	N89898.D	1	09/02/14	KD	n/a	n/a	MSN3329

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Compound	MC33209-3 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
67-64-1	Acetone	ND		250	99.4	40* [a]	250	94.1	38* [a]	5	70-130/30
107-02-8	Acrolein	ND		1250	1250	100	1250	1250	100	0	70-130/30
107-13-1	Acrylonitrile	ND		250	252	101	250	249	100	1	70-130/30
71-43-2	Benzene	ND		250	230	92	250	234	94	2	70-130/30
108-86-1	Bromobenzene	ND		250	236	94	250	234	94	1	70-130/30
74-97-5	Bromochloromethane	ND		250	259	104	250	252	101	3	70-130/30
75-27-4	Bromodichloromethane	ND		250	257	103	250	257	103	0	70-130/30
75-25-2	Bromoform	ND		250	241	96	250	239	96	1	70-130/30
74-83-9	Bromomethane	ND		250	186	74	250	204	82	9	70-130/30
78-93-3	2-Butanone (MEK)	ND		250	175	70	250	164	66* [a]	6	70-130/30
104-51-8	n-Butylbenzene	ND		250	239	96	250	236	94	1	70-130/30
135-98-8	sec-Butylbenzene	ND		250	221	88	250	218	87	1	70-130/30
98-06-6	tert-Butylbenzene	ND		250	222	89	250	218	87	2	70-130/30
75-15-0	Carbon disulfide	ND		250	255	102	250	258	103	1	70-130/30
56-23-5	Carbon tetrachloride	ND		250	248	99	250	255	102	3	70-130/30
108-90-7	Chlorobenzene	ND		250	226	90	250	230	92	2	70-130/30
75-00-3	Chloroethane	ND		250	249	100	250	248	99	0	70-130/30
110-75-8	2-Chloroethyl vinyl ether	ND		250	241	96	250	242	97	0	70-130/30
67-66-3	Chloroform	ND		250	232	93	250	234	94	1	70-130/30
74-87-3	Chloromethane	ND		250	202	81	250	210	84	4	70-130/30
95-49-8	o-Chlorotoluene	ND		250	229	92	250	229	92	0	70-130/30
106-43-4	p-Chlorotoluene	ND		250	229	92	250	230	92	0	70-130/30
124-48-1	Dibromochloromethane	ND		250	260	104	250	259	104	0	70-130/30
95-50-1	1,2-Dichlorobenzene	ND		250	246	98	250	244	98	1	70-130/30
541-73-1	1,3-Dichlorobenzene	ND		250	231	92	250	231	92	0	70-130/30
106-46-7	1,4-Dichlorobenzene	ND		250	229	92	250	231	92	1	70-130/30
75-71-8	Dichlorodifluoromethane	ND		250	187	75	250	184	74	2	70-130/30
75-34-3	1,1-Dichloroethane	1.0		250	251	100	250	253	101	1	70-130/30
107-06-2	1,2-Dichloroethane	ND		250	234	94	250	233	93	0	70-130/30
75-35-4	1,1-Dichloroethene	ND		250	233	93	250	240	96	3	70-130/30
156-59-2	cis-1,2-Dichloroethene	ND		250	233	93	250	235	94	1	70-130/30
156-60-5	trans-1,2-Dichloroethene	ND		250	236	94	250	241	96	2	70-130/30
78-87-5	1,2-Dichloropropane	ND		250	246	98	250	247	99	0	70-130/30
142-28-9	1,3-Dichloropropane	ND		250	224	90	250	225	90	0	70-130/30
594-20-7	2,2-Dichloropropane	ND		250	251	100	250	254	102	1	70-130/30
563-58-6	1,1-Dichloropropene	ND		250	224	90	250	228	91	2	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33209-3MS	N89911.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3MSD	N89912.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3	N89898.D	1	09/02/14	KD	n/a	n/a	MSN3329

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

6.3.2

CAS No.	Compound	MC33209-3 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
10061-01-5	cis-1,3-Dichloropropene	ND		250	238	95	250	240	96	1	70-130/30
10061-02-6	trans-1,3-Dichloropropene	ND		250	277	111	250	277	111	0	70-130/30
123-91-1	1,4-Dioxane	ND		625	650	104	625	669	107	3	70-130/30
97-63-2	Ethyl methacrylate	ND		250	260	104	250	259	104	0	72-139/30
100-41-4	Ethylbenzene	ND		250	227	91	250	226	90	0	70-130/30
87-68-3	Hexachlorobutadiene	ND		250	196	78	250	197	79	1	70-130/30
591-78-6	2-Hexanone	ND		250	136	54* a	250	132	53* a	3	70-130/30
98-82-8	Isopropylbenzene	ND		250	226	90	250	226	90	0	70-130/30
99-87-6	p-Isopropyltoluene	ND		250	230	92	250	228	91	1	70-130/30
1634-04-4	Methyl Tert Butyl Ether	ND		250	234	94	250	237	95	1	70-130/30
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		250	232	93	250	220	88	5	70-130/30
74-95-3	Methylene bromide	ND		250	240	96	250	239	96	0	70-130/30
75-09-2	Methylene chloride	ND		250	230	92	250	231	92	0	70-130/30
91-20-3	Naphthalene	ND		250	235	94	250	245	98	4	70-130/30
103-65-1	n-Propylbenzene	ND		250	231	92	250	229	92	1	70-130/30
100-42-5	Styrene	ND		250	239	96	250	241	96	1	70-130/30
630-20-6	1,1,1,2-Tetrachloroethane	ND		250	230	92	250	235	94	2	70-130/30
79-34-5	1,1,2,2-Tetrachloroethane	ND		250	233	93	250	231	92	1	70-130/30
127-18-4	Tetrachloroethene	ND		250	221	88	250	226	90	2	70-130/30
108-88-3	Toluene	ND		250	241	96	250	240	96	0	70-130/30
87-61-6	1,2,3-Trichlorobenzene	ND		250	226	90	250	229	92	1	70-130/30
120-82-1	1,2,4-Trichlorobenzene	ND		250	220	88	250	222	89	1	70-130/30
71-55-6	1,1,1-Trichloroethane	ND		250	234	94	250	237	95	1	70-130/30
79-00-5	1,1,2-Trichloroethane	ND		250	239	96	250	233	93	3	70-130/30
79-01-6	Trichloroethene	ND		250	201	80	250	206	82	2	70-130/30
75-69-4	Trichlorofluoromethane	ND		250	214	86	250	214	86	0	70-130/30
96-18-4	1,2,3-Trichloropropane	ND		250	240	96	250	237	95	1	70-130/30
95-63-6	1,2,4-Trimethylbenzene	ND		250	230	92	250	230	92	0	70-130/30
108-67-8	1,3,5-Trimethylbenzene	ND		250	216	86	250	214	86	1	70-130/30
108-05-4	Vinyl Acetate	ND		250	219	88	250	221	88	1	70-130/30
75-01-4	Vinyl chloride	ND		250	182	73	250	184	74	1	70-130/30
	m,p-Xylene	ND		500	451	90	500	454	91	1	70-130/30
95-47-6	o-Xylene	ND		250	229	92	250	229	92	0	70-130/30
1330-20-7	Xylene (total)	ND		750	680	91	750	683	91	0	70-130/30

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33209-3MS	N89911.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3MSD	N89912.D	5	09/02/14	KD	n/a	n/a	MSN3329
MC33209-3	N89898.D	1	09/02/14	KD	n/a	n/a	MSN3329

6.3.2

The QC reported here applies to the following samples: Method: SW846 8260C

MC33045-2, MC33045-3

CAS No.	Surrogate Recoveries	MS	MSD	MC33209-3	Limits
1868-53-7	Dibromofluoromethane	92%	91%	92%	70-130%
2037-26-5	Toluene-D8	93%	93%	92%	70-130%
460-00-4	4-Bromofluorobenzene	85%	85%	89%	70-130%

(a) Outside control limits due to possible matrix interference. Refer to Blank Spike.

* = Outside of Control Limits.

Volatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSM2398-CC2378	Injection Date:	08/25/14
Lab File ID:	M67787.D	Injection Time:	12:37
Instrument ID:	GCMSM	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	240871	9.35	392916	10.22	169370	13.51	223130	16.07	87001	6.84
Upper Limit [a]	481742	9.85	785832	10.72	338740	14.01	446260	16.57	174002	7.34
Lower Limit [b]	120436	8.85	196458	9.72	84685	13.01	111565	15.57	43501	6.34
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSM2398-BS	240871	9.35	392916	10.22	169370	13.51	223130	16.07	87001	6.84
MSM2398-BSD	252970	9.34	403445	10.22	176041	13.51	229592	16.07	86714	6.86
MSM2398-MB	250900	9.35	397203	10.22	167616	13.50	233384	16.07	86667	6.86
ZZZZZZ	223175	9.35	367495	10.22	158975	13.51	203639	16.07	137475	6.84
ZZZZZZ	252718	9.34	402530	10.22	172495	13.51	227342	16.07	91412	6.85
ZZZZZZ	252055	9.35	402902	10.22	173712	13.50	236297	16.07	92423	6.85
ZZZZZZ	268726	9.35	427639	10.23	180693	13.50	247457	16.07	93396	6.86
ZZZZZZ	253536	9.35	407234	10.23	176118	13.50	233933	16.07	93864	6.85
ZZZZZZ	248034	9.35	395707	10.22	169972	13.51	228974	16.07	92842	6.84
ZZZZZZ	250556	9.34	404786	10.23	176995	13.51	234406	16.07	87859	6.85
ZZZZZZ	246295	9.35	394685	10.22	169609	13.50	235309	16.07	87865	6.85
ZZZZZZ	246748	9.34	399199	10.22	173443	13.50	234740	16.07	84151	6.85
ZZZZZZ	232786	9.35	385004	10.22	169150	13.50	246045	16.07	161340	6.84
ZZZZZZ	255059	9.35	418317	10.22	185835	13.51	256138	16.07	158896	6.84
ZZZZZZ	240380	9.34	388861	10.22	173991	13.51	252902	16.07	154802	6.85
ZZZZZZ	260719	9.35	430778	10.23	182027	13.51	247783	16.07	173771	6.86
MC33045-1	244477	9.35	400688	10.23	180387	13.51	255721	16.07	154375	6.84
MC33045-1MS	242067	9.35	406089	10.23	185386	13.50	257364	16.07	162917	6.85
MC33045-1MSD	256203	9.35	433544	10.23	193191	13.51	265571	16.07	165200	6.86
ZZZZZZ	227765	9.35	361575	10.22	155941	13.51	216102	16.07	86365	6.84
ZZZZZZ	231691	9.35	373650	10.22	167261	13.51	226900	16.07	90913	6.86

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.4.1

Volatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSN3329-CC3314	Injection Date:	09/02/14
Lab File ID:	N89887.D	Injection Time:	10:16
Instrument ID:	GCMSN	Method:	SW846 8260C

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	279331	9.12	424735	9.99	244469	13.24	181239	15.80	124653	6.70
Upper Limit [a]	558662	9.62	849470	10.49	488938	13.74	362478	16.30	249306	7.20
Lower Limit [b]	139666	8.62	212368	9.49	122235	12.74	90620	15.30	62327	6.20
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSN3329-BS	279331	9.12	424735	9.99	244469	13.24	181239	15.80	124653	6.70
MSN3329-BSD	300512	9.12	454308	9.99	256627	13.24	195886	15.80	134903	6.70
MSN3329-MB	266333	9.12	400460	9.99	211409	13.24	154306	15.80	131566	6.71
ZZZZZZ	252274	9.12	382658	9.99	206994	13.24	150629	15.80	127535	6.71
ZZZZZZ	244235	9.12	376433	9.99	202489	13.24	144955	15.80	130623	6.71
ZZZZZZ	237888	9.12	362038	9.99	197806	13.24	142945	15.80	115324	6.71
ZZZZZZ	231332	9.12	358143	9.99	192571	13.24	138513	15.80	123093	6.71
MC33045-3	226299	9.12	339750	9.99	188949	13.24	134772	15.80	119483	6.71
MC33045-2	220366	9.12	338766	9.99	185163	13.24	133551	15.80	118047	6.71
ZZZZZZ	219722	9.12	342533	9.99	188564	13.24	131637	15.80	114719	6.71
MC33209-3	218411	9.12	333822	9.99	182716	13.24	129014	15.80	107849	6.71
ZZZZZZ	217544	9.12	338416	9.99	184505	13.24	130467	15.80	102913	6.71
ZZZZZZ	210315	9.12	319948	9.99	177589	13.24	127427	15.80	103644	6.72
ZZZZZZ	211989	9.12	323103	9.99	177140	13.24	125721	15.80	103567	6.71
ZZZZZZ	207660	9.12	323001	9.99	179710	13.24	129486	15.80	107063	6.71
ZZZZZZ	215267	9.12	341968	9.99	235569	13.24	193135	15.80	121485	6.70
ZZZZZZ	237571	9.12	360581	9.99	241240	13.24	177481	15.80	104218	6.69
ZZZZZZ	248829	9.12	376308	9.99	205836	13.24	146290	15.80	118990	6.71
MC33209-3MS	250783	9.12	387649	9.99	226243	13.24	173172	15.80	105526	6.70
MC33209-3MSD	267448	9.12	412457	9.99	238861	13.24	183196	15.80	112318	6.69

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

6.4.2

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC33045-2	N89896.D	92	92	90
MC33045-3	N89895.D	90	93	89
MC33209-3MS	N89911.D	92	93	85
MC33209-3MSD	N89912.D	91	93	85
MSN3329-BS	N89887.D	90	92	86
MSN3329-BSD	N89888.D	88	92	84
MSN3329-MB	N89890.D	88	91	89

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.1

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8260C Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC33045-1	M67804.D	102	90	84
MC33045-1MS	M67805.D	102	90	84
MC33045-1MSD	M67806.D	102	89	85
MSM2398-BS	M67787.D	91	86	87
MSM2398-BSD	M67788.D	90	88	85
MSM2398-MB	M67790.D	90	89	83

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

6.5.2

New England ACCUTEST LABORATORIES

GC/MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-MB	R39553.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic acid	ND	480	60	ug/kg	
95-57-8	2-Chlorophenol	ND	240	11	ug/kg	
59-50-7	4-Chloro-3-methyl phenol	ND	480	12	ug/kg	
120-83-2	2,4-Dichlorophenol	ND	480	14	ug/kg	
105-67-9	2,4-Dimethylphenol	ND	480	79	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	960	120	ug/kg	
534-52-1	4,6-Dinitro-o-cresol	ND	480	60	ug/kg	
95-48-7	2-Methylphenol	ND	480	19	ug/kg	
	3&4-Methylphenol	ND	480	23	ug/kg	
88-75-5	2-Nitrophenol	ND	480	13	ug/kg	
100-02-7	4-Nitrophenol	ND	960	90	ug/kg	
87-86-5	Pentachlorophenol	ND	480	34	ug/kg	
108-95-2	Phenol	ND	240	14	ug/kg	
95-95-4	2,4,5-Trichlorophenol	ND	480	12	ug/kg	
88-06-2	2,4,6-Trichlorophenol	ND	480	12	ug/kg	
62-53-3	Aniline	ND	480	24	ug/kg	
101-55-3	4-Bromophenyl phenyl ether	ND	240	12	ug/kg	
85-68-7	Butyl benzyl phthalate	ND	240	9.8	ug/kg	
100-51-6	Benzyl Alcohol	ND	480	24	ug/kg	
91-58-7	2-Chloronaphthalene	ND	240	13	ug/kg	
106-47-8	4-Chloroaniline	ND	480	12	ug/kg	
111-91-1	bis(2-Chloroethoxy)methane	ND	240	11	ug/kg	
111-44-4	bis(2-Chloroethyl)ether	ND	240	15	ug/kg	
108-60-1	bis(2-Chloroisopropyl)ether	ND	240	17	ug/kg	
7005-72-3	4-Chlorophenyl phenyl ether	ND	240	15	ug/kg	
122-66-7	1,2-Diphenylhydrazine	ND	240	11	ug/kg	
121-14-2	2,4-Dinitrotoluene	ND	480	32	ug/kg	
606-20-2	2,6-Dinitrotoluene	ND	480	12	ug/kg	
91-94-1	3,3'-Dichlorobenzidine	ND	240	24	ug/kg	
132-64-9	Dibenzofuran	ND	96	13	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	240	26	ug/kg	
117-84-0	Di-n-octyl phthalate	ND	240	7.5	ug/kg	
84-66-2	Diethyl phthalate	ND	240	12	ug/kg	
131-11-3	Dimethyl phthalate	ND	240	14	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	240	8.9	ug/kg	
118-74-1	Hexachlorobenzene	ND	240	15	ug/kg	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-MB	R39553.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	480	120	ug/kg	
67-72-1	Hexachloroethane	ND	240	12	ug/kg	
78-59-1	Isophorone	ND	240	11	ug/kg	
88-74-4	2-Nitroaniline	ND	480	12	ug/kg	
99-09-2	3-Nitroaniline	ND	480	26	ug/kg	
100-01-6	4-Nitroaniline	ND	480	12	ug/kg	
98-95-3	Nitrobenzene	ND	240	13	ug/kg	
62-75-9	n-Nitrosodimethylamine	ND	240	11	ug/kg	
621-64-7	N-Nitroso-di-n-propylamine	ND	240	14	ug/kg	
86-30-6	N-Nitrosodiphenylamine	ND	240	15	ug/kg	
110-86-1	Pyridine	ND	480	24	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	69%	30-130%
4165-62-2	Phenol-d5	58%	30-130%
118-79-6	2,4,6-Tribromophenol	60%	30-130%
4165-60-0	Nitrobenzene-d5	64%	30-130%
321-60-8	2-Fluorobiphenyl	71%	30-130%
1718-51-0	Terphenyl-d14	85%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/kg	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-MB	F75568.D	1	08/26/14	WK	08/22/14	OP39514	MSF3321

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic Acid	ND	10	2.5	ug/l	
95-57-8	2-Chlorophenol	ND	5.0	0.31	ug/l	
59-50-7	4-Chloro-3-methyl phenol	ND	10	0.83	ug/l	
120-83-2	2,4-Dichlorophenol	ND	10	0.40	ug/l	
105-67-9	2,4-Dimethylphenol	ND	10	0.56	ug/l	
51-28-5	2,4-Dinitrophenol	ND	20	2.5	ug/l	
534-52-1	4,6-Dinitro-o-cresol	ND	10	1.9	ug/l	
95-48-7	2-Methylphenol	ND	10	0.23	ug/l	
	3&4-Methylphenol	ND	10	0.47	ug/l	
88-75-5	2-Nitrophenol	ND	10	2.9	ug/l	
100-02-7	4-Nitrophenol	ND	20	0.53	ug/l	
87-86-5	Pentachlorophenol	ND	10	1.1	ug/l	
108-95-2	Phenol	ND	5.0	0.30	ug/l	
95-95-4	2,4,5-Trichlorophenol	ND	10	0.37	ug/l	
88-06-2	2,4,6-Trichlorophenol	ND	10	0.18	ug/l	
62-53-3	Aniline	ND	10	0.64	ug/l	
101-55-3	4-Bromophenyl phenyl ether	ND	5.0	0.47	ug/l	
85-68-7	Butyl benzyl phthalate	ND	5.0	0.53	ug/l	
100-51-6	Benzyl Alcohol	ND	10	2.3	ug/l	
91-58-7	2-Chloronaphthalene	ND	5.0	0.31	ug/l	
106-47-8	4-Chloroaniline	ND	10	0.56	ug/l	
111-91-1	bis(2-Chloroethoxy)methane	ND	5.0	0.29	ug/l	
111-44-4	bis(2-Chloroethyl)ether	ND	5.0	0.35	ug/l	
108-60-1	bis(2-Chloroisopropyl)ether	ND	5.0	0.33	ug/l	
7005-72-3	4-Chlorophenyl phenyl ether	ND	5.0	0.25	ug/l	
122-66-7	1,2-Diphenylhydrazine	ND	5.0	0.24	ug/l	
121-14-2	2,4-Dinitrotoluene	ND	10	0.46	ug/l	
606-20-2	2,6-Dinitrotoluene	ND	10	0.30	ug/l	
91-94-1	3,3'-Dichlorobenzidine	ND	5.0	0.27	ug/l	
132-64-9	Dibenzofuran	ND	2.0	0.26	ug/l	
84-74-2	Di-n-butyl phthalate	0.33	5.0	0.17	ug/l	J
117-84-0	Di-n-octyl phthalate	ND	5.0	0.28	ug/l	
84-66-2	Diethyl phthalate	ND	5.0	0.20	ug/l	
131-11-3	Dimethyl phthalate	ND	5.0	0.34	ug/l	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	2.0	0.33	ug/l	
118-74-1	Hexachlorobenzene	ND	5.0	0.29	ug/l	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-MB	F75568.D	1	08/26/14	WK	08/22/14	OP39514	MSF3321

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

CAS No.	Compound	Result	RL	MDL	Units	Q
77-47-4	Hexachlorocyclopentadiene	ND	10	1.3	ug/l	
67-72-1	Hexachloroethane	ND	5.0	0.30	ug/l	
78-59-1	Isophorone	ND	5.0	0.45	ug/l	
88-74-4	2-Nitroaniline	ND	10	0.40	ug/l	
99-09-2	3-Nitroaniline	ND	10	1.4	ug/l	
100-01-6	4-Nitroaniline	ND	10	2.2	ug/l	
98-95-3	Nitrobenzene	ND	5.0	0.39	ug/l	
62-75-9	n-Nitrosodimethylamine	ND	5.0	1.0	ug/l	
621-64-7	N-Nitroso-di-n-propylamine	ND	5.0	0.40	ug/l	
86-30-6	N-Nitrosodiphenylamine	ND	5.0	0.19	ug/l	
110-86-1	Pyridine	ND	10	0.52	ug/l	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	47%	15-110%
4165-62-2	Phenol-d5	31%	15-110%
118-79-6	2,4,6-Tribromophenol	83%	15-110%
4165-60-0	Nitrobenzene-d5	76%	30-130%
321-60-8	2-Fluorobiphenyl	78%	30-130%
1718-51-0	Terphenyl-d14	89%	30-130%

CAS No.	Tentatively Identified Compounds	R.T.	Est. Conc.	Units	Q
	Total TIC, Semi-Volatile		0	ug/l	

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39508-MB	I91326.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	4.8	0.83	ug/kg	
208-96-8	Acenaphthylene	ND	4.8	0.73	ug/kg	
120-12-7	Anthracene	ND	4.8	1.1	ug/kg	
56-55-3	Benzo(a)anthracene	ND	4.8	2.2	ug/kg	
50-32-8	Benzo(a)pyrene	ND	4.8	1.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	4.8	2.1	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	4.8	1.3	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	4.8	1.5	ug/kg	
218-01-9	Chrysene	ND	4.8	1.3	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	4.8	1.4	ug/kg	
206-44-0	Fluoranthene	ND	4.8	1.4	ug/kg	
86-73-7	Fluorene	ND	4.8	0.95	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	4.8	1.2	ug/kg	
90-12-0	1-Methylnaphthalene	ND	9.6	1.1	ug/kg	
91-57-6	2-Methylnaphthalene	ND	9.6	0.90	ug/kg	
85-01-8	Phenanthrene	ND	4.8	1.0	ug/kg	
129-00-0	Pyrene	ND	4.8	1.5	ug/kg	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	36%	15-110%
4165-62-2	Phenol-d5	36%	15-110%
118-79-6	2,4,6-Tribromophenol	37%	15-110%
4165-60-0	Nitrobenzene-d5	74%	30-130%
321-60-8	2-Fluorobiphenyl	71%	30-130%
1718-51-0	Terphenyl-d14	105%	30-130%

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39515-MB	I91344.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-2

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.10	0.069	ug/l	
208-96-8	Acenaphthylene	ND	0.10	0.050	ug/l	
120-12-7	Anthracene	ND	0.10	0.092	ug/l	
56-55-3	Benzo(a)anthracene	ND	0.050	0.020	ug/l	
50-32-8	Benzo(a)pyrene	ND	0.10	0.029	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	0.050	0.032	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	0.10	0.027	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	0.10	0.039	ug/l	
218-01-9	Chrysene	ND	0.10	0.024	ug/l	
53-70-3	Dibenzo(a,h)anthracene	ND	0.10	0.032	ug/l	
206-44-0	Fluoranthene	ND	0.10	0.041	ug/l	
86-73-7	Fluorene	ND	0.10	0.099	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.10	0.031	ug/l	
90-12-0	1-Methylnaphthalene	ND	0.20	0.050	ug/l	
91-57-6	2-Methylnaphthalene	ND	0.20	0.13	ug/l	
85-01-8	Phenanthrene	0.022	0.050	0.013	ug/l	J
129-00-0	Pyrene	ND	0.10	0.038	ug/l	

CAS No.	Surrogate Recoveries		Limits
367-12-4	2-Fluorophenol	51%	15-110%
4165-62-2	Phenol-d5	33%	15-110%
118-79-6	2,4,6-Tribromophenol	79%	15-110%
4165-60-0	Nitrobenzene-d5	81%	30-130%
321-60-8	2-Fluorobiphenyl	75%	30-130%
1718-51-0	Terphenyl-d14	103%	30-130%

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-BS	R39574.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
65-85-0	Benzoic acid	2440	2000	82	30-130
95-57-8	2-Chlorophenol	2440	1820	75	30-130
59-50-7	4-Chloro-3-methyl phenol	2440	2140	88	30-130
120-83-2	2,4-Dichlorophenol	2440	2080	85	30-130
105-67-9	2,4-Dimethylphenol	2440	1960	80	30-130
51-28-5	2,4-Dinitrophenol	2440	1810	74	30-130
534-52-1	4,6-Dinitro-o-cresol	2440	2350	96	30-130
95-48-7	2-Methylphenol	2440	1790	73	30-130
	3&4-Methylphenol	4880	3620	74	30-130
88-75-5	2-Nitrophenol	2440	1830	75	30-130
100-02-7	4-Nitrophenol	2440	2220	91	30-130
87-86-5	Pentachlorophenol	2440	2400	98	30-130
108-95-2	Phenol	2440	1830	75	30-130
95-95-4	2,4,5-Trichlorophenol	2440	2250	92	30-130
88-06-2	2,4,6-Trichlorophenol	2440	2090	86	30-130
62-53-3	Aniline	2440	1450	59	40-140
101-55-3	4-Bromophenyl phenyl ether	2440	2660	109	40-140
85-68-7	Butyl benzyl phthalate	2440	2430	100	40-140
100-51-6	Benzyl Alcohol	2440	1980	81	40-140
91-58-7	2-Chloronaphthalene	2440	2390	98	40-140
106-47-8	4-Chloroaniline	2440	2090	86	40-140
111-91-1	bis(2-Chloroethoxy)methane	2440	2100	86	40-140
111-44-4	bis(2-Chloroethyl)ether	2440	1970	81	40-140
108-60-1	bis(2-Chloroisopropyl)ether	2440	2640	108	40-140
7005-72-3	4-Chlorophenyl phenyl ether	2440	2450	100	40-140
122-66-7	1,2-Diphenylhydrazine	2440	2440	100	40-140
121-14-2	2,4-Dinitrotoluene	2440	2480	102	40-140
606-20-2	2,6-Dinitrotoluene	2440	2330	95	40-140
91-94-1	3,3'-Dichlorobenzidine	2440	2180	89	40-140
132-64-9	Dibenzofuran	2440	2340	96	40-140
84-74-2	Di-n-butyl phthalate	2440	2550	104	40-140
117-84-0	Di-n-octyl phthalate	2440	2320	95	40-140
84-66-2	Diethyl phthalate	2440	2620	107	40-140
131-11-3	Dimethyl phthalate	2440	2530	104	40-140
117-81-7	bis(2-Ethylhexyl)phthalate	2440	2550	104	40-140
118-74-1	Hexachlorobenzene	2440	2600	106	40-140

* = Outside of Control Limits.

7.2.1

7

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-BS	R39574.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
77-47-4	Hexachlorocyclopentadiene	2440	762	31* a	40-140
67-72-1	Hexachloroethane	2440	1810	74	40-140
78-59-1	Isophorone	2440	1930	79	40-140
88-74-4	2-Nitroaniline	2440	2510	103	40-140
99-09-2	3-Nitroaniline	2440	2530	104	40-140
100-01-6	4-Nitroaniline	2440	2390	98	40-140
98-95-3	Nitrobenzene	2440	2030	83	40-140
62-75-9	n-Nitrosodimethylamine	2440	1550	63	40-140
621-64-7	N-Nitroso-di-n-propylamine	2440	2130	87	40-140
86-30-6	N-Nitrosodiphenylamine	2440	2310	95	40-140
110-86-1	Pyridine	2440	1260	52	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	74%	30-130%
4165-62-2	Phenol-d5	73%	30-130%
118-79-6	2,4,6-Tribromophenol	86%	30-130%
4165-60-0	Nitrobenzene-d5	69%	30-130%
321-60-8	2-Fluorobiphenyl	75%	30-130%
1718-51-0	Terphenyl-d14	81%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

7.2.1

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-BS	R39563.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
65-85-0	Benzoic Acid	50	18.6	37	30-130
95-57-8	2-Chlorophenol	50	38.7	77	30-130
59-50-7	4-Chloro-3-methyl phenol	50	42.6	85	30-130
120-83-2	2,4-Dichlorophenol	50	41.6	83	30-130
105-67-9	2,4-Dimethylphenol	50	20.7	41	30-130
51-28-5	2,4-Dinitrophenol	50	42.4	85	30-130
534-52-1	4,6-Dinitro-o-cresol	50	51.4	103	30-130
95-48-7	2-Methylphenol	50	31.8	64	30-130
	3&4-Methylphenol	100	61.8	62	30-130
88-75-5	2-Nitrophenol	50	45.4	91	30-130
100-02-7	4-Nitrophenol	50	19.5	39	30-130
87-86-5	Pentachlorophenol	50	47.7	95	30-130
108-95-2	Phenol	50	17.4	35	30-130
95-95-4	2,4,5-Trichlorophenol	50	44.4	89	30-130
88-06-2	2,4,6-Trichlorophenol	50	46.1	92	30-130
62-53-3	Aniline	50	32.4	65	40-140
101-55-3	4-Bromophenyl phenyl ether	50	47.0	94	40-140
85-68-7	Butyl benzyl phthalate	50	44.4	89	40-140
100-51-6	Benzyl Alcohol	50	31.3	63	40-140
91-58-7	2-Chloronaphthalene	50	43.9	88	40-140
106-47-8	4-Chloroaniline	50	38.1	76	40-140
111-91-1	bis(2-Chloroethoxy)methane	50	38.8	78	40-140
111-44-4	bis(2-Chloroethyl)ether	50	37.5	75	40-140
108-60-1	bis(2-Chloroisopropyl)ether	50	50.5	101	40-140
7005-72-3	4-Chlorophenyl phenyl ether	50	42.9	86	40-140
122-66-7	1,2-Diphenylhydrazine	50	47.2	94	40-140
121-14-2	2,4-Dinitrotoluene	50	44.3	89	40-140
606-20-2	2,6-Dinitrotoluene	50	43.4	87	40-140
91-94-1	3,3'-Dichlorobenzidine	50	42.6	85	40-140
132-64-9	Dibenzofuran	50	40.9	82	40-140
84-74-2	Di-n-butyl phthalate	50	45.7	91	40-140
117-84-0	Di-n-octyl phthalate	50	44.4	89	40-140
84-66-2	Diethyl phthalate	50	45.2	90	40-140
131-11-3	Dimethyl phthalate	50	44.1	88	40-140
117-81-7	bis(2-Ethylhexyl)phthalate	50	45.1	90	40-140
118-74-1	Hexachlorobenzene	50	47.6	95	40-140

* = Outside of Control Limits.

7.2.2

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-BS	R39563.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
77-47-4	Hexachlorocyclopentadiene	50	25.1	50	40-140
67-72-1	Hexachloroethane	50	37.9	76	40-140
78-59-1	Isophorone	50	36.8	74	40-140
88-74-4	2-Nitroaniline	50	44.2	88	40-140
99-09-2	3-Nitroaniline	50	42.8	86	40-140
100-01-6	4-Nitroaniline	50	40.6	81	40-140
98-95-3	Nitrobenzene	50	39.4	79	40-140
62-75-9	n-Nitrosodimethylamine	50	23.9	48	40-140
621-64-7	N-Nitroso-di-n-propylamine	50	39.0	78	40-140
86-30-6	N-Nitrosodiphenylamine	50	40.1	80	40-140
110-86-1	Pyridine	50	24.1	48	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	49%	15-110%
4165-62-2	Phenol-d5	32%	15-110%
118-79-6	2,4,6-Tribromophenol	94%	15-110%
4165-60-0	Nitrobenzene-d5	79%	30-130%
321-60-8	2-Fluorobiphenyl	80%	30-130%
1718-51-0	Terphenyl-d14	92%	30-130%

* = Outside of Control Limits.

7.2.2

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39508-BS	I91327.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	Limits
83-32-9	Acenaphthene	2440	2210	91	40-140
208-96-8	Acenaphthylene	2440	1900	78	40-140
120-12-7	Anthracene	2440	2340	96	40-140
56-55-3	Benzo(a)anthracene	2440	2890	118	40-140
50-32-8	Benzo(a)pyrene	2440	2530	104	40-140
205-99-2	Benzo(b)fluoranthene	2440	3300	135	40-140
191-24-2	Benzo(g,h,i)perylene	2440	2650	109	40-140
207-08-9	Benzo(k)fluoranthene	2440	2370	97	40-140
218-01-9	Chrysene	2440	2420	99	40-140
53-70-3	Dibenzo(a,h)anthracene	2440	2850	117	40-140
206-44-0	Fluoranthene	2440	2790	114	40-140
86-73-7	Fluorene	2440	2290	94	40-140
193-39-5	Indeno(1,2,3-cd)pyrene	2440	2770	113	40-140
90-12-0	1-Methylnaphthalene	2440	2100	86	40-140
91-57-6	2-Methylnaphthalene	2440	2150	88	40-140
85-01-8	Phenanthrene	2440	2350	96	40-140
129-00-0	Pyrene	2440	2780	114	40-140

CAS No.	Surrogate Recoveries	BSP	Limits
367-12-4	2-Fluorophenol	36%	15-110%
4165-62-2	Phenol-d5	35%	15-110%
118-79-6	2,4,6-Tribromophenol	42%	15-110%
4165-60-0	Nitrobenzene-d5	75%	30-130%
321-60-8	2-Fluorobiphenyl	75%	30-130%
1718-51-0	Terphenyl-d14	100%	30-130%

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39515-BS	I91345.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404
OP39515-BSD	I91395.D	1	08/26/14	WK	08/22/14	OP39515	MSI3405

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	BSD ug/l	BSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	50	39.7	79	40.6	81	2	40-140/30
208-96-8	Acenaphthylene	50	37.8	76	38.9	78	3	40-140/30
120-12-7	Anthracene	50	41.5	83	41.7	83	0	40-140/30
56-55-3	Benzo(a)anthracene	50	51.3	103	50.0	100	3	40-140/30
50-32-8	Benzo(a)pyrene	50	50.1	100	50.5	101	1	40-140/30
205-99-2	Benzo(b)fluoranthene	50	58.6	117	54.7	109	7	40-140/30
191-24-2	Benzo(g,h,i)perylene	50	49.3	99	50.0	100	1	40-140/30
207-08-9	Benzo(k)fluoranthene	50	42.0	84	45.7	91	8	40-140/30
218-01-9	Chrysene	50	43.4	87	42.5	85	2	40-140/30
53-70-3	Dibenzo(a,h)anthracene	50	51.8	104	52.9	106	2	40-140/30
206-44-0	Fluoranthene	50	48.3	97	47.4	95	2	40-140/30
86-73-7	Fluorene	50	41.8	84	41.5	83	1	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	50	50.8	102	51.4	103	1	40-140/30
90-12-0	1-Methylnaphthalene	50	39.4	79	40.3	81	2	40-140/30
91-57-6	2-Methylnaphthalene	50	40.0	80	41.0	82	2	40-140/30
85-01-8	Phenanthrene	50	41.8	84	41.7	83	0	40-140/30
129-00-0	Pyrene	50	48.6	97	47.8	96	2	40-140/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
367-12-4	2-Fluorophenol	51%	53%	15-110%
4165-62-2	Phenol-d5	34%	35%	15-110%
118-79-6	2,4,6-Tribromophenol	88%	88%	15-110%
4165-60-0	Nitrobenzene-d5	84%	85%	30-130%
321-60-8	2-Fluorobiphenyl	77%	79%	30-130%
1718-51-0	Terphenyl-d14	103%	103%	30-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-MS	R39575.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458
OP39507-MSD	R39576.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458
MC33045-1	R39577.D	1	08/26/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic acid	ND		2510	1720	68	2540	1770	70	3	30-130/30
95-57-8	2-Chlorophenol	ND		2510	1880	75	2540	1880	74	0	30-130/30
59-50-7	4-Chloro-3-methyl phenol	ND		2510	2050	82	2540	2040	80	0	30-130/30
120-83-2	2,4-Dichlorophenol	ND		2510	2080	83	2540	2030	80	2	30-130/30
105-67-9	2,4-Dimethylphenol	ND		2510	1940	77	2540	1860	73	4	30-130/30
51-28-5	2,4-Dinitrophenol	ND		2510	1600	64	2540	1470	58	8	30-130/30
534-52-1	4,6-Dinitro-o-cresol	ND		2510	2360	94	2540	2300	91	3	30-130/30
95-48-7	2-Methylphenol	ND		2510	1850	74	2540	1820	72	2	30-130/30
	3&4-Methylphenol	ND		5020	3800	76	5070	3710	73	2	30-130/30
88-75-5	2-Nitrophenol	ND		2510	1900	76	2540	1810	71	5	30-130/30
100-02-7	4-Nitrophenol	ND		2510	2310	92	2540	2150	85	7	30-130/30
87-86-5	Pentachlorophenol	ND		2510	2720	108	2540	2780	110	2	30-130/30
108-95-2	Phenol	ND		2510	1910	76	2540	1870	74	2	30-130/30
95-95-4	2,4,5-Trichlorophenol	ND		2510	2250	90	2540	2140	84	5	30-130/30
88-06-2	2,4,6-Trichlorophenol	ND		2510	2240	89	2540	2090	82	7	30-130/30
62-53-3	Aniline	ND		2510	1560	62	2540	1480	58	5	40-140/30
101-55-3	4-Bromophenyl phenyl ether	ND		2510	2740	109	2540	2660	105	3	40-140/30
85-68-7	Butyl benzyl phthalate	ND		2510	2570	102	2540	2520	99	2	40-140/30
100-51-6	Benzyl Alcohol	ND		2510	2050	82	2540	1960	77	4	40-140/30
91-58-7	2-Chloronaphthalene	ND		2510	2590	103	2540	2470	97	5	40-140/30
106-47-8	4-Chloroaniline	ND		2510	2100	84	2540	2000	79	5	40-140/30
111-91-1	bis(2-Chloroethoxy)methane	ND		2510	2180	87	2540	2120	84	3	40-140/30
111-44-4	bis(2-Chloroethyl)ether	ND		2510	2110	84	2540	1970	78	7	40-140/30
108-60-1	bis(2-Chloroisopropyl)ether	ND		2510	2760	110	2540	2680	106	3	40-140/30
7005-72-3	4-Chlorophenyl phenyl ether	ND		2510	2640	105	2540	2480	98	6	40-140/30
122-66-7	1,2-Diphenylhydrazine	ND		2510	2550	102	2540	2490	98	2	40-140/30
121-14-2	2,4-Dinitrotoluene	ND		2510	2530	101	2540	2390	94	6	40-140/30
606-20-2	2,6-Dinitrotoluene	ND		2510	2440	97	2540	2320	91	5	40-140/30
91-94-1	3,3'-Dichlorobenzidine	ND		2510	2310	92	2540	2290	90	1	40-140/30
132-64-9	Dibenzofuran	ND		2510	2450	98	2540	2380	94	3	40-140/30
84-74-2	Di-n-butyl phthalate	ND		2510	2580	103	2540	2480	98	4	40-140/30
117-84-0	Di-n-octyl phthalate	ND		2510	2350	94	2540	2280	90	3	40-140/30
84-66-2	Diethyl phthalate	ND		2510	2730	109	2540	2610	103	4	40-140/30
131-11-3	Dimethyl phthalate	ND		2510	2670	106	2540	2560	101	4	40-140/30
117-81-7	bis(2-Ethylhexyl)phthalate	ND		2510	2670	106	2540	2590	102	3	40-140/30
118-74-1	Hexachlorobenzene	ND		2510	2630	105	2540	2620	103	0	40-140/30

* = Outside of Control Limits.

7.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39507-MS	R39575.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458
OP39507-MSD	R39576.D	1	08/25/14	WK	08/21/14	OP39507	MSR1458
MC33045-1	R39577.D	1	08/26/14	WK	08/21/14	OP39507	MSR1458

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-1

7.4.1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		2510	842	34* a	2540	786	31* a	7	40-140/30
67-72-1	Hexachloroethane	ND		2510	1850	74	2540	1850	73	0	40-140/30
78-59-1	Isophorone	ND		2510	1990	79	2540	1910	75	4	40-140/30
88-74-4	2-Nitroaniline	ND		2510	2620	104	2540	2500	99	5	40-140/30
99-09-2	3-Nitroaniline	ND		2510	2560	102	2540	2430	96	5	40-140/30
100-01-6	4-Nitroaniline	ND		2510	2510	100	2540	2370	93	6	40-140/30
98-95-3	Nitrobenzene	ND		2510	2070	82	2540	2070	82	0	40-140/30
62-75-9	n-Nitrosodimethylamine	ND		2510	1900	76	2540	1780	70	7	40-140/30
621-64-7	N-Nitroso-di-n-propylamine	ND		2510	2200	88	2540	2130	84	3	40-140/30
86-30-6	N-Nitrosodiphenylamine	ND		2510	2360	94	2540	2320	91	2	40-140/30
110-86-1	Pyridine	ND		2510	1470	59	2540	1450	57	1	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC33045-1	Limits
367-12-4	2-Fluorophenol	76%	72%	76%	30-130%
4165-62-2	Phenol-d5	72%	69%	66%	30-130%
118-79-6	2,4,6-Tribromophenol	86%	82%	85%	30-130%
4165-60-0	Nitrobenzene-d5	70%	67%	68%	30-130%
321-60-8	2-Fluorobiphenyl	77%	75%	76%	30-130%
1718-51-0	Terphenyl-d14	83%	81%	82%	30-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-MS	R39564.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458
OP39514-MSD	R39565.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458
MC33000-1	F75569.D	1	08/26/14	WK	08/22/14	OP39514	MSF3321

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

CAS No.	Compound	MC33000-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
65-85-0	Benzoic Acid	ND		50	20.0	40	50	19.6	39	2	30-130/20
95-57-8	2-Chlorophenol	ND		50	36.8	74	50	40.2	80	9	30-130/20
59-50-7	4-Chloro-3-methyl phenol	ND		50	42.1	84	50	41.2	82	2	30-130/20
120-83-2	2,4-Dichlorophenol	ND		50	39.6	79	50	42.6	85	7	30-130/20
105-67-9	2,4-Dimethylphenol	ND		50	21.7	43	50	23.6	47	8	30-130/20
51-28-5	2,4-Dinitrophenol	ND		50	42.3	85	50	42.6	85	1	30-130/20
534-52-1	4,6-Dinitro-o-cresol	ND		50	50.4	101	50	53.0	106	5	30-130/20
95-48-7	2-Methylphenol	ND		50	31.3	63	50	33.3	67	6	30-130/20
	3&4-Methylphenol	ND		100	60.0	60	100	63.9	64	6	30-130/20
88-75-5	2-Nitrophenol	ND		50	39.4	79	50	42.8	86	8	30-130/20
100-02-7	4-Nitrophenol	ND		50	20.7	41	50	21.4	43	3	30-130/20
87-86-5	Pentachlorophenol	ND		50	45.8	92	50	45.1	90	2	30-130/20
108-95-2	Phenol	ND		50	17.0	34	50	18.1	36	6	30-130/20
95-95-4	2,4,5-Trichlorophenol	ND		50	45.2	90	50	45.7	91	1	30-130/20
88-06-2	2,4,6-Trichlorophenol	ND		50	43.4	87	50	44.2	88	2	30-130/20
62-53-3	Aniline	ND		50	31.2	62	50	33.4	67	7	40-140/20
101-55-3	4-Bromophenyl phenyl ether	ND		50	48.9	98	50	47.5	95	3	40-140/20
85-68-7	Butyl benzyl phthalate	ND		50	44.5	89	50	44.8	90	1	40-140/20
100-51-6	Benzyl Alcohol	ND		50	31.5	63	50	33.0	66	5	40-140/20
91-58-7	2-Chloronaphthalene	ND		50	42.0	84	50	44.4	89	6	40-140/20
106-47-8	4-Chloroaniline	ND		50	36.2	72	50	37.8	76	4	40-140/20
111-91-1	bis(2-Chloroethoxy)methane	ND		50	37.4	75	50	39.1	78	4	40-140/20
111-44-4	bis(2-Chloroethyl)ether	ND		50	37.0	74	50	40.6	81	9	40-140/20
108-60-1	bis(2-Chloroisopropyl)ether	ND		50	50.9	102	50	52.1	104	2	40-140/20
7005-72-3	4-Chlorophenyl phenyl ether	ND		50	43.6	87	50	42.0	84	4	40-140/20
122-66-7	1,2-Diphenylhydrazine	ND		50	48.7	97	50	48.2	96	1	40-140/20
121-14-2	2,4-Dinitrotoluene	ND		50	43.0	86	50	44.9	90	4	40-140/20
606-20-2	2,6-Dinitrotoluene	ND		50	40.4	81	50	43.9	88	8	40-140/20
91-94-1	3,3'-Dichlorobenzidine	ND		50	47.8	96	50	47.7	95	0	40-140/20
132-64-9	Dibenzofuran	ND		50	41.2	82	50	41.6	83	1	40-140/20
84-74-2	Di-n-butyl phthalate	0.33	J	50	46.4	92	50	46.3	92	0	40-140/20
117-84-0	Di-n-octyl phthalate	ND		50	43.9	88	50	45.1	90	3	40-140/20
84-66-2	Diethyl phthalate	ND		50	46.1	92	50	45.0	90	2	40-140/20
131-11-3	Dimethyl phthalate	ND		50	44.5	89	50	44.1	88	1	40-140/20
117-81-7	bis(2-Ethylhexyl)phthalate	ND		50	45.1	90	50	45.3	91	0	40-140/20
118-74-1	Hexachlorobenzene	ND		50	48.5	97	50	48.0	96	1	40-140/20

* = Outside of Control Limits.

7.4.2

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39514-MS	R39564.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458
OP39514-MSD	R39565.D	1	08/25/14	WK	08/22/14	OP39514	MSR1458
MC33000-1	F75569.D	1	08/26/14	WK	08/22/14	OP39514	MSF3321

The QC reported here applies to the following samples: Method: SW846 8270D

MC33045-2

7.4.2

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CAS No.	Compound	MC33000-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
77-47-4	Hexachlorocyclopentadiene	ND		50	21.6	43	50	21.1	42	2	40-140/20
67-72-1	Hexachloroethane	ND		50	36.4	73	50	39.0	78	7	40-140/20
78-59-1	Isophorone	ND		50	35.6	71	50	37.7	75	6	40-140/20
88-74-4	2-Nitroaniline	ND		50	43.5	87	50	44.7	89	3	40-140/20
99-09-2	3-Nitroaniline	ND		50	43.9	88	50	42.9	86	2	40-140/20
100-01-6	4-Nitroaniline	ND		50	42.7	85	50	41.1	82	4	40-140/20
98-95-3	Nitrobenzene	ND		50	38.0	76	50	40.2	80	6	40-140/20
62-75-9	n-Nitrosodimethylamine	ND		50	21.9	44	50	24.3	49	10	40-140/20
621-64-7	N-Nitroso-di-n-propylamine	ND		50	39.3	79	50	39.7	79	1	40-140/20
86-30-6	N-Nitrosodiphenylamine	ND		50	41.8	84	50	40.1	80	4	40-140/20
110-86-1	Pyridine	ND		50	21.4	43	50	25.0	50	16	40-140/20

CAS No.	Surrogate Recoveries	MS	MSD	MC33000-1	Limits
367-12-4	2-Fluorophenol	47%	50%	49%	15-110%
4165-62-2	Phenol-d5	31%	33%	32%	15-110%
118-79-6	2,4,6-Tribromophenol	94%	93%	88%	15-110%
4165-60-0	Nitrobenzene-d5	75%	77%	74%	30-130%
321-60-8	2-Fluorobiphenyl	74%	79%	77%	30-130%
1718-51-0	Terphenyl-d14	91%	91%	91%	30-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39508-MS	I91328.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403
OP39508-MSD	I91329.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403
MC33045-1	I91330.D	1	08/22/14	WK	08/21/14	OP39508	MSI3403

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	ND		2510	2310	92	2540	2250	89	3	40-140/30
208-96-8	Acenaphthylene	ND		2510	1980	79	2540	1940	76	2	40-140/30
120-12-7	Anthracene	ND		2510	2460	98	2540	2350	93	5	40-140/30
56-55-3	Benzo(a)anthracene	ND		2510	3000	119	2540	2890	114	4	40-140/30
50-32-8	Benzo(a)pyrene	ND		2510	2630	105	2540	2510	99	5	40-140/30
205-99-2	Benzo(b)fluoranthene	ND		2510	3140	125	2540	3330	131	6	40-140/30
191-24-2	Benzo(g,h,i)perylene	ND		2510	2760	110	2540	2610	103	6	40-140/30
207-08-9	Benzo(k)fluoranthene	ND		2510	2650	106	2540	2290	90	15	40-140/30
218-01-9	Chrysene	ND		2510	2520	100	2540	2420	95	4	40-140/30
53-70-3	Dibenzo(a,h)anthracene	ND		2510	2950	117	2540	2810	111	5	40-140/30
206-44-0	Fluoranthene	ND		2510	2920	116	2540	2820	111	3	40-140/30
86-73-7	Fluorene	ND		2510	2390	95	2540	2310	91	3	40-140/30
193-39-5	Indeno(1,2,3-cd)pyrene	ND		2510	2880	115	2540	2740	108	5	40-140/30
90-12-0	1-Methylnaphthalene	ND		2510	2220	88	2540	2050	81	8	40-140/30
91-57-6	2-Methylnaphthalene	1.2	J	2510	2260	90	2540	2080	82	8	40-140/30
85-01-8	Phenanthrene	ND		2510	2450	98	2540	2370	93	3	40-140/30
129-00-0	Pyrene	ND		2510	2880	115	2540	2800	110	3	40-140/30

CAS No.	Surrogate Recoveries	MS	MSD	MC33045-1	Limits
367-12-4	2-Fluorophenol	35%	34%	36%	15-110%
4165-62-2	Phenol-d5	35%	34%	36%	15-110%
118-79-6	2,4,6-Tribromophenol	43%	41%	37%	15-110%
4165-60-0	Nitrobenzene-d5	75%	73%	74%	30-130%
321-60-8	2-Fluorobiphenyl	75%	73%	71%	30-130%
1718-51-0	Terphenyl-d14	99%	96%	98%	30-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39515-MS	I91346.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404
OP39515-MSD	I91347.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404
MC33000-2	I91348.D	1	08/25/14	WK	08/22/14	OP39515	MSI3404

The QC reported here applies to the following samples: Method: SW846 8270D BY SIM

MC33045-2

7.4.4

CAS No.	Compound	MC33000-2 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
83-32-9	Acenaphthene	ND		50	39.8	80	50	39.9	80	0	40-140/20
208-96-8	Acenaphthylene	ND		50	38.1	76	50	38.3	77	1	40-140/20
120-12-7	Anthracene	ND		50	43.2	86	50	42.7	85	1	40-140/20
56-55-3	Benzo(a)anthracene	ND		50	52.7	105	50	51.5	103	2	40-140/20
50-32-8	Benzo(a)pyrene	ND		50	51.6	103	50	51.0	102	1	40-140/20
205-99-2	Benzo(b)fluoranthene	ND		50	59.3	119	50	58.1	116	2	40-140/20
191-24-2	Benzo(g,h,i)perylene	ND		50	51.1	102	50	50.5	101	1	40-140/20
207-08-9	Benzo(k)fluoranthene	ND		50	43.8	88	50	44.0	88	0	40-140/20
218-01-9	Chrysene	ND		50	44.1	88	50	43.5	87	1	40-140/20
53-70-3	Dibenzo(a,h)anthracene	ND		50	53.6	107	50	53.0	106	1	40-140/20
206-44-0	Fluoranthene	ND		50	49.0	98	50	48.6	97	1	40-140/20
86-73-7	Fluorene	ND		50	42.6	85	50	41.7	83	2	40-140/20
193-39-5	Indeno(1,2,3-cd)pyrene	ND		50	52.5	105	50	52.0	104	1	40-140/20
90-12-0	1-Methylnaphthalene	ND		50	38.3	77	50	39.7	79	4	40-140/20
91-57-6	2-Methylnaphthalene	ND		50	39.1	78	50	40.8	82	4	40-140/20
85-01-8	Phenanthrene	0.018	J	50	43.2	86	50	42.3	85	2	40-140/20
129-00-0	Pyrene	ND		50	49.2	98	50	48.7	97	1	40-140/20

CAS No.	Surrogate Recoveries	MS	MSD	MC33000-2	Limits
367-12-4	2-Fluorophenol	50%	52%	50%	15-110%
4165-62-2	Phenol-d5	33%	34%	33%	15-110%
118-79-6	2,4,6-Tribromophenol	90%	89%	82%	15-110%
4165-60-0	Nitrobenzene-d5	81%	84%	80%	30-130%
321-60-8	2-Fluorobiphenyl	74%	76%	74%	30-130%
1718-51-0	Terphenyl-d14	103%	103%	105%	30-130%

* = Outside of Control Limits.

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3321-CC3320	Injection Date:	08/26/14
Lab File ID:	F75552.D	Injection Time:	09:16
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	105941	4.46	388658	5.52	233145	7.05	398145	8.33	424610	10.98	402312	12.72
Upper Limit [a]	211882	4.96	777316	6.02	466290	7.55	796290	8.83	849220	11.48	804624	13.22
Lower Limit [b]	52971	3.96	194329	5.02	116573	6.55	199073	7.83	212305	10.48	201156	12.22
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39491-MB	167414	4.46	627563	5.52	367987	7.05	610358	8.33	638288	10.98	566516	12.72
OP39491-BS	131236	4.46	489135	5.52	293555	7.05	484870	8.33	527548	10.98	487604	12.72
ZZZZZZ	149445	4.46	561713	5.52	324276	7.05	539013	8.33	555775	10.98	509373	12.72
ZZZZZZ	137633	4.46	516725	5.52	303330	7.05	523526	8.33	545294	10.98	478998	12.72
ZZZZZZ	146047	4.46	542046	5.51	321431	7.04	541380	8.33	566765	10.98	524681	12.72
ZZZZZZ	156872	4.46	586558	5.52	345208	7.05	579701	8.33	573207	10.98	525512	12.72
OP39482-MB	135927	4.46	503662	5.52	305689	7.05	519228	8.33	569661	10.98	545344	12.72
OP39482-BS	129703	4.46	482619	5.52	288785	7.05	493748	8.33	525732	10.98	499277	12.72
OP39482-MS	122451	4.46	459878	5.52	278057	7.05	477836	8.33	526905	10.98	502651	12.72
OP39482-MSD	119060	4.46	443773	5.52	262123	7.05	447932	8.33	481612	10.98	455767	12.72
MC32700-20	128467	4.46	476992	5.52	284074	7.05	489559	8.33	521861	10.98	493491	12.72
ZZZZZZ	135797	4.46	510268	5.52	307993	7.05	529468	8.33	587576	10.98	584486	12.72
ZZZZZZ	124701	4.46	464594	5.52	279223	7.05	470447	8.33	508733	10.98	500488	12.72
ZZZZZZ	120861	4.46	461060	5.52	280561	7.05	487680	8.33	555989	10.98	527813	12.72
OP39514-MB	145291	4.46	531725	5.52	317453	7.05	551361	8.33	597399	10.98	579216	12.72
MC33000-1	137076	4.46	520103	5.52	315551	7.05	544532	8.33	602842	10.98	596957	12.72
ZZZZZZ	135555	4.46	497748	5.51	293244	7.04	488335	8.33	489280	10.98	446390	12.72
OP39535-MB	125274	4.46	482214	5.52	289623	7.05	494320	8.33	549995	10.98	532294	12.72
OP39535-BS	133161	4.46	498457	5.52	300908	7.05	508920	8.33	549894	10.98	516555	12.72
ZZZZZZ	123405	4.46	468494	5.52	283778	7.05	492222	8.33	545541	10.98	530533	12.72
OP39498-MB	127709	4.46	479560	5.52	289382	7.04	494281	8.33	541153	10.98	542047	12.72
OP39498-BS	135077	4.46	498049	5.52	294044	7.05	502225	8.33	554861	10.98	544832	12.72
ZZZZZZ	141251	4.46	532602	5.52	322530	7.04	537000	8.33	574746	10.98	568266	12.72
ZZZZZZ	135441	4.46	503210	5.51	299802	7.04	521224	8.33	572784	10.98	572558	12.71

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSF3325-CC3320	Injection Date:	08/28/14
Lab File ID:	F75655.D	Injection Time:	15:40
Instrument ID:	GCMSF	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	120178	4.40	451306	5.46	275933	6.99	481127	8.27	548032	10.90	526966	12.63
Upper Limit [a]	240356	4.90	902612	5.96	551866	7.49	962254	8.77	1096064	11.40	1053932	13.13
Lower Limit [b]	60089	3.90	225653	4.96	137967	6.49	240564	7.77	274016	10.40	263483	12.13
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
MC33000-5	129152	4.40	488809	5.45	294928	6.99	501749	8.27	548643	10.90	534726	12.63
ZZZZZZ	136492	4.40	513128	5.46	312118	6.98	527968	8.27	584374	10.90	564520	12.63
ZZZZZZ	125831	4.40	474753	5.46	293395	6.99	509526	8.27	585473	10.90	575543	12.63
ZZZZZZ	122684	4.40	473215	5.45	287769	6.98	510048	8.27	583782	10.90	564863	12.63
ZZZZZZ	132748	4.40	503034	5.45	304558	6.98	533265	8.27	610580	10.90	598656	12.63
ZZZZZZ	137967	4.40	466848	5.47	299712	6.98	497250	8.27	544141	10.90	530605	12.63
ZZZZZZ	129906	4.40	497125	5.46	304355	6.98	534784	8.27	609016	10.90	592271	12.63
ZZZZZZ	141755	4.40	536376	5.45	319290	6.98	555055	8.27	618171	10.90	602366	12.63
ZZZZZZ	138144	4.40	529378	5.46	327148	6.98	564549	8.27	652765	10.90	633456	12.63
OP39543-MB	158931	4.40	583827	5.45	347455	6.98	579565	8.27	583923	10.90	534780	12.63
OP39543-BS	125433	4.40	468038	5.46	279268	6.98	472203	8.27	517051	10.90	489205	12.63
ZZZZZZ	147148	4.40	533368	5.45	309978	6.99	496307	8.27	546162	10.90	617788	12.63
ZZZZZZ	128323	4.40	481018	5.46	292110	6.99	487756	8.27	550466	10.90	602067	12.63
ZZZZZZ	147863	4.40	537799	5.46	311851	6.98	499124	8.27	540762	10.90	597949	12.63
MC33045-2	145816	4.40	551129	5.46	338449	6.99	596003	8.27	697971	10.90	747375	12.63
ZZZZZZ	144574	4.40	532620	5.46	309125	6.98	513388	8.27	631163	10.90	708430	12.63
ZZZZZZ	137388	4.40	521888	5.45	323861	6.98	559617	8.27	659362	10.90	715621	12.63
ZZZZZZ	141153	4.40	524093	5.45	305074	6.98	514559	8.27	624391	10.90	685045	12.63
ZZZZZZ	149570	4.40	557240	5.46	340866	6.99	592620	8.27	710600	10.90	766623	12.63
ZZZZZZ	135768	4.40	507447	5.45	308921	6.99	535685	8.27	644649	10.90	694391	12.63
ZZZZZZ	165483	4.40	604357	5.45	338555	6.98	538353	8.27	643657	10.90	728021	12.63

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3403-CC3386	Injection Date:	08/22/14
Lab File ID:	I91321.D	Injection Time:	14:48
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT
Check Std	431227	3.93	964297	4.99	514249	6.52	875697	7.89	622016	10.66	1558066	12.14
Upper Limit [a]	862454	4.43	1928594	5.49	1028498	7.02	1751394	8.39	1244032	11.16	3116132	12.64
Lower Limit [b]	215614	3.43	482149	4.49	257125	6.02	437849	7.39	311008	10.16	779033	11.64
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39497-LB	551445	3.95	1229705	4.99	641266	6.52	1054862	7.89	729328	10.66	1858781	12.14
OP39497-MB	551445	3.95	1229705	4.99	641266	6.52	1054862	7.89	729328	10.66	1858781	12.14
OP39497-BS	518317	3.95	1137654	5.00	593864	6.52	999914	7.89	717821	10.67	1783828	12.14
ZZZZZZ	516245	3.95	1151161	4.99	601850	6.52	998200	7.88	688843	10.66	1772880	12.14
ZZZZZZ	495448	3.95	1100614	4.99	575579	6.52	952714	7.88	660795	10.66	1681734	12.14
OP39508-MB	463847	3.95	1039382	4.99	541173	6.52	884484	7.88	572497	10.66	1431517	12.14
OP39508-BS	512451	3.95	1117131	5.00	570544	6.52	927803	7.89	616420	10.66	1463580	12.14
OP39508-MS	442016	3.95	958069	5.00	496648	6.52	815761	7.89	548522	10.66	1327140	12.14
OP39508-MSD	508097	3.95	1098200	5.00	560081	6.52	898246	7.89	588867	10.66	1414721	12.14
MC33045-1	553561	3.95	1217825	4.99	630157	6.52	1008333	7.88	655931	10.66	1615679	12.14
ZZZZZZ	464389	3.95	1017944	4.99	515146	6.52	820965	7.88	523016	10.66	1271895	12.14
ZZZZZZ	499262	3.95	1103935	4.99	562368	6.52	889389	7.88	554747	10.66	1333271	12.14
ZZZZZZ	502091	3.95	1068495	4.99	518125	6.52	798857	7.88	465896	10.66	1171720	12.14
ZZZZZZ	545800	3.95	1175742	4.99	581753	6.52	895217	7.89	516456	10.66	1269287	12.14
OP39445-MB	462626	3.95	1008381	4.99	502237	6.52	793490	7.88	518310	10.66	1371218	12.14
OP39445-BS	456587	3.95	995544	5.00	492310	6.52	784109	7.89	531305	10.66	1351561	12.14
OP39445-BSD	491885	3.95	1077255	5.00	535056	6.52	851851	7.89	580181	10.66	1485967	12.14
ZZZZZZ	492522	3.95	1049176	5.00	531491	6.52	848110	7.88	564220	10.66	1475574	12.14
ZZZZZZ	478461	3.95	1024188	5.00	518898	6.52	830336	7.88	556137	10.66	1449865	12.14
ZZZZZZ	473354	3.95	1037138	4.99	524486	6.52	837678	7.88	562757	10.66	1463117	12.14

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.3

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3404-CC3386	Injection Date:	08/25/14
Lab File ID:	I91343.D	Injection Time:	08:29
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	436327	3.92	972159	4.97	512179	6.49	875428	7.86	619001	10.63	1547330	12.10
Upper Limit [a]	872654	4.42	1944318	5.47	1024358	6.99	1750856	8.36	1238002	11.13	3094660	12.60
Lower Limit [b]	218164	3.42	486080	4.47	256090	5.99	437714	7.36	309501	10.13	773665	11.60
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39515-MB	465329	3.92	1045090	4.97	557134	6.49	935831	7.85	654721	10.63	1682789	12.10
OP39515-BS	442417	3.92	981014	4.97	521264	6.49	892709	7.86	637299	10.63	1573759	12.10
OP39515-MS	468910	3.92	1033941	4.97	550398	6.50	933398	7.86	677811	10.63	1652211	12.10
OP39515-MSD	448810	3.92	995998	4.97	534558	6.49	899987	7.86	650501	10.63	1582312	12.10
MC33000-2	467286	3.92	1049302	4.96	559701	6.49	940068	7.85	654073	10.63	1662261	12.10
ZZZZZZ	446440	3.92	1001482	4.96	529002	6.49	887371	7.85	622711	10.63	1549888	12.10
MC33045-2	472078	3.92	1056611	4.96	560888	6.49	938882	7.85	661002	10.63	1687896	12.10
OP39374-MB	433286	3.92	968894	4.96	512254	6.49	853690	7.85	600162	10.63	1520708	12.10
OP39374-BS	458492	3.92	1033725	4.97	542110	6.49	911613	7.86	655774	10.63	1590613	12.10
ZZZZZZ	473006	3.92	1066821	4.96	567341	6.49	953171	7.85	673120	10.63	1697909	12.10
ZZZZZZ	487009	3.92	1087125	4.96	583641	6.49	980512	7.85	687370	10.63	1740551	12.10
ZZZZZZ	468076	3.92	1054516	4.96	554681	6.49	937294	7.85	652236	10.63	1656084	12.10
ZZZZZZ	468012	3.92	1052025	4.96	560945	6.49	923649	7.85	654732	10.63	1666470	12.10
ZZZZZZ	439188	3.92	983387	4.96	520567	6.49	871126	7.85	605678	10.63	1542690	12.10
ZZZZZZ	486312	3.92	1082474	4.96	569645	6.49	960496	7.85	674741	10.63	1713788	12.10
ZZZZZZ	449362	3.92	1003762	4.96	531186	6.49	891084	7.85	622212	10.63	1578091	12.10
ZZZZZZ	439061	3.92	976706	4.96	511727	6.49	860242	7.85	602767	10.63	1539723	12.10
ZZZZZZ	444707	3.91	992440	4.96	520608	6.49	873341	7.85	608825	10.62	1555230	12.10
ZZZZZZ	434864	3.92	965899	4.96	506525	6.49	838408	7.85	588338	10.63	1489989	12.10
ZZZZZZ	452826	3.92	1012094	4.96	531971	6.49	888459	7.85	622843	10.63	1585771	12.10
ZZZZZZ	440887	3.92	984974	4.96	525197	6.49	883702	7.85	614956	10.63	1560870	12.10
ZZZZZZ	462240	3.92	1028780	4.96	542776	6.49	890609	7.85	628132	10.63	1596545	12.10
ZZZZZZ	465448	3.92	1031843	4.96	545974	6.49	909688	7.85	624691	10.62	1601023	12.10
ZZZZZZ	495796	3.92	1105800	4.96	586019	6.49	979505	7.85	685275	10.63	1727953	12.10
ZZZZZZ	493656	3.92	1102014	4.96	579429	6.49	968635	7.85	676434	10.63	1711150	12.10
ZZZZZZ	484936	3.92	1084628	4.96	571280	6.49	954694	7.85	668985	10.62	1692088	12.10
ZZZZZZ	468027	3.92	1046889	4.96	553381	6.49	931602	7.85	654322	10.63	1665480	12.10
ZZZZZZ	436671	3.92	967927	4.96	508551	6.49	856497	7.85	593830	10.62	1505148	12.10
ZZZZZZ	426558	3.92	948658	4.96	502373	6.49	836992	7.85	584280	10.62	1490673	12.10
ZZZZZZ	464427	3.92	1023410	4.96	540725	6.49	905145	7.85	627690	10.62	1590022	12.10
ZZZZZZ	466261	3.92	1035841	4.96	541731	6.49	904027	7.85	631942	10.62	1588436	12.10

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10

7.5.4

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3404-CC3386	Injection Date:	08/25/14
Lab File ID:	I91343.D	Injection Time:	08:29
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

Lab	IS 1		IS 2		IS 3		IS 4		IS 5		IS 6	
Sample ID	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT	AREA	RT

IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.4

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSI3405-CC3386	Injection Date:	08/26/14
Lab File ID:	I91378.D	Injection Time:	09:08
Instrument ID:	GCMSI	Method:	SW846 8270D BY SIM

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	433622	3.90	951427	4.95	507266	6.47	861488	7.83	615999	10.60	1539129	12.07
Upper Limit [a]	867244	4.40	1902854	5.45	1014532	6.97	1722976	8.33	1231998	11.10	3078258	12.57
Lower Limit [b]	216811	3.40	475714	4.45	253633	5.97	430744	7.33	308000	10.10	769565	11.57
Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
OP39483-MB	476578	3.90	1063971	4.94	568286	6.47	968141	7.83	690165	10.60	1744557	12.08
OP39483-BS	434916	3.90	959551	4.95	517486	6.47	881096	7.83	647175	10.61	1584951	12.08
OP39483-BSD	407105	3.90	912916	4.95	487903	6.47	839859	7.83	610754	10.61	1496548	12.08
OP39483-MS	410095	3.90	917422	4.95	495153	6.47	841923	7.83	616201	10.61	1501604	12.08
OP39483-MSD	382667	3.90	853234	4.95	462335	6.47	790024	7.83	571448	10.61	1399342	12.07
MC32700-21	422937	3.90	954423	4.94	510188	6.47	864296	7.82	607280	10.60	1524613	12.07
ZZZZZZ	410260	3.90	928047	4.94	496983	6.47	838461	7.82	589244	10.60	1486733	12.07
ZZZZZZ	453301	3.90	1026374	4.94	547383	6.47	933549	7.82	653164	10.60	1647448	12.07
ZZZZZZ	414146	3.90	923695	4.95	498429	6.47	842342	7.82	586102	10.60	1494416	12.07
ZZZZZZ	410755	3.90	925529	4.94	495438	6.47	839728	7.82	588667	10.60	1487884	12.07
ZZZZZZ	405603	3.90	917523	4.94	486168	6.47	821478	7.82	572821	10.60	1442088	12.07
ZZZZZZ	442562	3.90	984500	4.94	521308	6.47	890830	7.82	634731	10.60	1604237	12.07
ZZZZZZ	417951	3.90	931488	4.94	495465	6.47	838859	7.82	582218	10.60	1462099	12.07
ZZZZZZ	382923	3.90	853389	4.94	452027	6.47	765612	7.82	526538	10.60	1314688	12.07
ZZZZZZ	413929	3.90	926351	4.94	488894	6.47	818423	7.82	570935	10.60	1425794	12.07
OP39515-BSD	445157	3.90	996336	4.95	535845	6.47	912498	7.83	663704	10.61	1579796	12.07
ZZZZZZ	408498	3.90	923552	4.94	490261	6.47	837501	7.82	582534	10.60	1455846	12.07

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

7.5.5

Semivolatile Internal Standard Area Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	MSR1458-CC1457	Injection Date:	08/25/14
Lab File ID:	R39551A.D	Injection Time:	14:14
Instrument ID:	GCMSR	Method:	SW846 8270D

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
Check Std	34540	5.47	141538	6.57	93756	8.10	172733	9.41	241057	12.04	266906	13.76
Upper Limit [a]	69080	5.97	283076	7.07	187512	8.60	345466	9.91	482114	12.54	533812	14.26
Lower Limit [b]	17270	4.97	70769	6.07	46878	7.60	86367	8.91	120529	11.54	133453	13.26

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT	IS 6 AREA	RT
ZZZZZZ	40285	5.47	150181	6.57	101334	8.10	193105	9.41	262140	12.03	317422	13.76
OP39507-MB	16755[c]	5.47	60011[c]	6.57	39690[c]	8.10	79480[c]	9.41	122328	12.03	165180	13.76
ZZZZZZ	29756	5.47	110290	6.57	72144	8.10	143588	9.41	195578	12.03	231189	13.76
ZZZZZZ	53258	5.47	209784	6.57	140451	8.10	271185	9.41	346411	12.03	397119	13.76
ZZZZZZ	34790	5.47	137364	6.57	94702	8.10	183359	9.41	270206	12.03	353825	13.76
ZZZZZZ	39881	5.47	157809	6.57	104214	8.10	204538	9.41	283182	12.03	343228	13.76
ZZZZZZ	20795	5.47	75947	6.57	48625	8.10	88760	9.41	118545[c]	12.03	151675	13.76
ZZZZZZ	50306	5.47	195967	6.57	127948	8.10	241692	9.41	319111	12.03	366553	13.76
OP39514-BS	42890	5.47	166540	6.57	107005	8.10	198081	9.41	262973	12.03	293826	13.76
OP39514-MS	22732	5.47	89941	6.57	58782	8.10	108459	9.41	151697	12.03	172933	13.76
OP39514-MSD	35586	5.47	142868	6.57	91519	8.10	169093	9.41	226537	12.03	246873	13.76
OP39495-MB	32348	5.47	126471	6.57	80408	8.10	151129	9.41	198602	12.03	238527	13.76
OP39495-LB	32348	5.47	126471	6.57	80408	8.10	151129	9.41	198602	12.03	238527	13.76
OP39495-BS	42380	5.47	168042	6.57	108631	8.11	204148	9.41	268005	12.03	301924	13.76
OP39495-MS	14175[d]	5.47	54648[d]	6.57	34451[d]	8.10	65840[d]	9.41	88338[d]	12.03	93858[d]	13.76
OP39495-MSD	29214	5.47	112675	6.57	69713	8.10	127428	9.41	162919	12.03	182960	13.76
MC32957-1	29918	5.47	115187	6.57	72559	8.10	134637	9.41	178190	12.03	208876	13.76
ZZZZZZ	24462	5.47	91639	6.57	56488	8.10	107774	9.41	143444	12.03	164935	13.76
OP39507-BS	22999	5.47	86542	6.57	56967	8.10	108059	9.41	156243	12.03	191779	13.76
OP39507-MS	20366	5.47	78280	6.57	49289	8.10	94208	9.41	129240	12.03	160685	13.76
OP39507-MSD	21179	5.47	81841	6.57	51384	8.10	94356	9.41	128770	12.03	159249	13.75
MC33045-1	25894	5.47	95556	6.57	58763	8.10	110681	9.41	145716	12.03	194338	13.76

IS 1 = 1,4-Dichlorobenzene-d4
IS 2 = Naphthalene-d8
IS 3 = Acenaphthene-D10
IS 4 = Phenanthrene-d10
IS 5 = Chrysene-d12
IS 6 = Perylene-d12

(a) Upper Limit = +100% of check standard area; Retention time +0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.
(c) Outside control limits.Confirmed by reanalysis.
(d) Outside control limits due to possible matrix interference.

Semivolatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC33045-2	F75673.D	42	26	77	70	75	83
OP39514-BS	R39563.D	49	32	94	79	80	92
OP39514-MB	F75568.D	47	31	83	76	78	89
OP39514-MS	R39564.D	47	31	94	75	74	91
OP39514-MSD	R39565.D	50	33	93	77	79	91

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	15-110%
S2 = Phenol-d5	15-110%
S3 = 2,4,6-Tribromophenol	15-110%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.6.1

Semivolatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC33045-1	R39577.D	76	66	85	68	76	82
OP39507-BS	R39574.D	74	73	86	69	75	81
OP39507-MB	R39553.D	69	58	60	64	71	85
OP39507-MS	R39575.D	76	72	86	70	77	83
OP39507-MSD	R39576.D	72	69	82	67	75	81

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	30-130%
S2 = Phenol-d5	30-130%
S3 = 2,4,6-Tribromophenol	30-130%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

Semivolatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC33045-2	I91350.D	77	71	100
OP39515-BS	I91345.D	84	77	103
OP39515-BSD	I91395.D	85	79	103
OP39515-MB	I91344.D	81	75	103
OP39515-MS	I91346.D	81	74	103
OP39515-MSD	I91347.D	84	76	103

Surrogate Compounds	Recovery Limits
S1 = Nitrobenzene-d5	30-130%
S2 = 2-Fluorobiphenyl	30-130%
S3 = Terphenyl-d14	30-130%

Semivolatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8270D BY SIM Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3	S4	S5	S6
MC33045-1	I91330.D	36	36	37	74	71	98
OP39508-BS	I91327.D	36	35	42	75	75	100
OP39508-MB	I91326.D	36	36	37	74	71	105
OP39508-MS	I91328.D	35	35	43	75	75	99
OP39508-MSD	I91329.D	34	34	41	73	73	96

Surrogate Compounds	Recovery Limits
S1 = 2-Fluorophenol	15-110%
S2 = Phenol-d5	15-110%
S3 = 2,4,6-Tribromophenol	15-110%
S4 = Nitrobenzene-d5	30-130%
S5 = 2-Fluorobiphenyl	30-130%
S6 = Terphenyl-d14	30-130%

7.6.4

New England ACCUTEST LABORATORIES

GC Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries
- GC Surrogate Retention Time Summaries

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39555-MB	BB59382.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.5	0.73	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.5	0.61	ug/kg	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	127%	61-167%
460-00-4	Bromofluorobenzene (S)	137%	61-167%

8.1.1

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39646-MB	YZ91624.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-2, MC33045-4

CAS No.	Compound	Result	RL	MDL	Units	Q
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.015	0.0061	ug/l	
106-93-4	1,2-Dibromoethane	ND	0.015	0.0061	ug/l	

CAS No.	Surrogate Recoveries		Limits
460-00-4	Bromofluorobenzene (S)	80%	36-173%
460-00-4	Bromofluorobenzene (S)	74%	36-173%

8.1.2

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GWX3651-MB	WX74951A.D	1	08/27/14	TB	n/a	n/a	GWX3651

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-1

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	5.0	0.74	mg/kg	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	99%	61-116%

8.1.3

Method Blank Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4558-MB	AB85642.D	1	08/28/14	AF	n/a	n/a	GAB4558

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-2

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (VOA)	ND	0.10	0.013	mg/l	

CAS No.	Surrogate Recoveries		Limits
	2,3,4-Trifluorotoluene	91%	60-135%

8.1.4

Blank Spike Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39646-BS	YZ91625.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-2, MC33045-4

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
96-12-8	1,2-Dibromo-3-chloropropane	0.071	0.058	82	60-140
106-93-4	1,2-Dibromoethane	0.071	0.063	89	60-140

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	Bromofluorobenzene (S)	81%	36-173%
460-00-4	Bromofluorobenzene (S)	76%	36-173%

8.2.1

8

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39555-BS	BB59383.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318
OP39555-BSD	BB59389.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-1

CAS No.	Compound	Spike ug/kg	BSP ug/kg	BSP %	BSD ug/kg	BSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	33	33.5	102	44.5	136	28	59-142/30
106-93-4	1,2-Dibromoethane	33	32.4	98	36.0	110	11	56-140/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
460-00-4	Bromofluorobenzene (S)	113%	100%	61-167%
460-00-4	Bromofluorobenzene (S)	128%	141%	61-167%

8.3.1

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GWX3651-BSP	WX74952A.D	1	08/27/14	TB	n/a	n/a	GWX3651
GWX3651-BSD	WX74953A.D	1	08/27/14	TB	n/a	n/a	GWX3651

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-1

CAS No.	Compound	Spike mg/kg	BSP mg/kg	BSP %	BSD mg/kg	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	32.5	32.1	99	32.4	100	1	66-126/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	101%	96%	61-116%

8.3.2

* = Outside of Control Limits.

Blank Spike/Blank Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GAB4558-BSP	AB85643.D	1	08/28/14	AF	n/a	n/a	GAB4558
GAB4558-BSD	AB85644.D	1	08/28/14	AF	n/a	n/a	GAB4558

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-2

CAS No.	Compound	Spike mg/l	BSP mg/l	BSP %	BSD mg/l	BSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	0.65	0.636	98	0.635	98	0	68-134/30

CAS No.	Surrogate Recoveries	BSP	BSD	Limits
	2,3,4-Trifluorotoluene	100%	99%	60-135%

8.3.3

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39555-MS	BB59387.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318
OP39555-MSD	BB59388.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318
MC33045-1	BB59391.D	1	08/27/14	NK	08/26/14	OP39555	GBB3318

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-1

CAS No.	Compound	MC33045-1 ug/kg	Q	Spike ug/kg	MS ug/kg	MS %	Spike ug/kg	MSD ug/kg	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		34.3	55.9	163*	34.1	50.5	148	10	40-156/27
106-93-4	1,2-Dibromoethane	ND		34.3	40.2	117	34.1	37.3	109	7	48-141/27

CAS No.	Surrogate Recoveries	MS	MSD	MC33045-1	Limits
460-00-4	Bromofluorobenzene (S)	107%	93%	94%	61-167%
460-00-4	Bromofluorobenzene (S)	142%	129%	130%	61-167%

(a) Outside control limits due to possible matrix interference.

* = Outside of Control Limits.

8.4.1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP39646-MS	YZ91626.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636
OP39646-MSD	YZ91627.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636
MC33200-2	YZ91628.D	1	09/03/14	NK	09/02/14	OP39646	GYZ7636

The QC reported here applies to the following samples: Method: SW846 8011

MC33045-2, MC33045-4

CAS No.	Compound	MC33200-2 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
96-12-8	1,2-Dibromo-3-chloropropane	ND		0.071	0.049	69	0.071	0.045	63* [a]	9	64-141/29
106-93-4	1,2-Dibromoethane	ND		0.071	0.055	77	0.071	0.052	73	6	63-163/27

CAS No.	Surrogate Recoveries	MS	MSD	MC33200-2	Limits
460-00-4	Bromofluorobenzene (S)	77%	66%	67%	36-173%
460-00-4	Bromofluorobenzene (S)	64%	60%	72%	36-173%

(a) Outside control limits due to possible matrix interference.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33045-1MS	WX74956.D	1	08/27/14	TB	n/a	n/a	GWX3651
MC33045-1MSD	WX74957.D	1	08/27/14	TB	n/a	n/a	GWX3651
MC33045-1	WX74955.D	1	08/27/14	TB	n/a	n/a	GWX3651

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-1

CAS No.	Compound	MC33045-1 mg/kg	Q	Spike mg/kg	MS mg/kg	MS %	Spike mg/kg	MSD mg/kg	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	2.55	J	80.1	80.1	97	80.1	79.9	97	0	41-150/20

CAS No.	Surrogate Recoveries	MS	MSD	MC33045-1	Limits
	2,3,4-Trifluorotoluene	105%	104%	100%	61-116%

* = Outside of Control Limits.

8.4.3

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC33192-2MS	AB85648.D	1	08/28/14	AF	n/a	n/a	GAB4558
MC33192-2MSD	AB85649.D	1	08/28/14	AF	n/a	n/a	GAB4558
MC33192-2	AB85647.D	1	08/28/14	AF	n/a	n/a	GAB4558

The QC reported here applies to the following samples: Method: SW846 8015

MC33045-2

CAS No.	Compound	MC33192-2 mg/l	Q	Spike mg/l	MS mg/l	MS %	Spike mg/l	MSD mg/l	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (VOA)	ND		0.65	0.640	98	0.65	0.642	99	0	72-131/20

CAS No.	Surrogate Recoveries	MS	MSD	MC33192-2	Limits
	2,3,4-Trifluorotoluene	100%	100%	92%	60-135%

8.4.4

* = Outside of Control Limits.

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC33045-2	YZ91629.D	69	76
MC33045-4	YZ91630.D	70	76
OP39646-BS	YZ91625.D	81	76
OP39646-MB	YZ91624.D	80	74
OP39646-MS	YZ91626.D	77	64
OP39646-MSD	YZ91627.D	66	60

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	36-173%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.1

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8011 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]
MC33045-1	BB59391.D	94	130
OP39555-BS	BB59383.D	113	128
OP39555-BSD	BB59389.D	100	141
OP39555-MB	BB59382.D	127	137
OP39555-MS	BB59387.D	107	142
OP39555-MSD	BB59388.D	93	129

Surrogate Compounds	Recovery Limits
S1 = Bromofluorobenzene (S)	61-167%

(a) Recovery from GC signal #2
(b) Recovery from GC signal #1

8.5.2

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015 Matrix: AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC33045-2	AB85646.D	94
GAB4558-BSD	AB85644.D	99
GAB4558-BSP	AB85643.D	100
GAB4558-MB	AB85642.D	91
MC33192-2MS	AB85648.D	100
MC33192-2MSD	AB85649.D	100

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	60-135%

(a) Recovery from GC signal #1

8.5.3

Volatile Surrogate Recovery Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Method: SW846 8015 Matrix: SO

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC33045-1	WX74955.D	100
GWX3651-BSD	WX74953A.D	96
GWX3651-BSP	WX74952A.D	101
GWX3651-MB	WX74951A.D	99
MC33045-1MS	WX74956.D	105
MC33045-1MSD	WX74957.D	104

Surrogate Compounds	Recovery Limits
S1 = 2,3,4-Trifluorotoluene	61-116%

(a) Recovery from GC signal #1

8.5.4

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4559-CC4486	Injection Date:	08/28/14
Lab File ID:	AB85641A.D	Injection Time:	07:26
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std	20.32	20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GAB4558-MB	AB85642.D	08/28/14	08:04		20.32
GAB4559-MB	AB85642A.D	08/28/14	08:04	20.32	20.32
GAB4558-BSP	AB85643.D	08/28/14	08:42		20.32
GAB4559-BSP	AB85643A.D	08/28/14	08:42	20.32	20.32
GAB4558-BSD	AB85644.D	08/28/14	09:21		20.32
GAB4559-BSD	AB85644A.D	08/28/14	09:21	20.32	20.32
ZZZZZZ	AB85645.D	08/28/14	10:00		20.32
MC33045-2	AB85646.D	08/28/14	10:38		20.32
MC33192-2	AB85647.D	08/28/14	11:16		20.32
MC33192-2MS	AB85648.D	08/28/14	11:54		20.32
MC33192-2MSD	AB85649.D	08/28/14	12:32		20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.1

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GWX3650-CC3234	Injection Date:	08/27/14
Lab File ID:	WX74950.D	Injection Time:	09:37
Instrument ID:	GCWX	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std	19.95	19.95

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GWX3651-MB	WX74951A.D	08/27/14	10:14		19.95
GWX3650-MB	WX74951.D	08/27/14	10:14	19.95	19.95
GWX3650-BSP	WX74952.D	08/27/14	10:51	19.95	19.95
GWX3651-BSP	WX74952A.D	08/27/14	10:51		19.95
GWX3651-BSD	WX74953A.D	08/27/14	11:29		19.95
GWX3650-BSD	WX74953.D	08/27/14	11:29	19.95	19.95
ZZZZZZ	WX74954.D	08/27/14	12:06	19.95	19.95
MC33045-1	WX74955.D	08/27/14	12:44		19.95
MC33045-1MS	WX74956.D	08/27/14	13:22		19.95
MC33045-1MSD	WX74957.D	08/27/14	14:00		19.95
ZZZZZZ	WX74958.D	08/27/14	14:38		19.95
ZZZZZZ	WX74959.D	08/27/14	15:16		19.95
ZZZZZZ	WX74960.D	08/27/14	15:54		19.95

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.2

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBB3318-ICC3318	Injection Date:	08/27/14
Lab File ID:	BB59377.D	Injection Time:	09:51
Instrument ID:	GCBB	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.24	4.23

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
ZZZZZZ	BB59380.D	08/27/14	11:03	4.25	4.23
ZZZZZZ	BB59381.D	08/27/14	11:28	4.24	4.23
OP39555-MB	BB59382.D	08/27/14	11:52	4.24	4.23
OP39555-BS	BB59383.D	08/27/14	12:16	4.24	4.23
ZZZZZZ	BB59384.D	08/27/14	12:40	4.24	4.23
ZZZZZZ	BB59385.D	08/27/14	13:05	4.24	4.23
ZZZZZZ	BB59386.D	08/27/14	13:29	4.24	4.23
OP39555-MS	BB59387.D	08/27/14	13:54	4.24	4.23
OP39555-MSD	BB59388.D	08/27/14	14:18	4.24	4.23
OP39555-BSD	BB59389.D	08/27/14	14:42	4.24	4.23

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.3

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GBB3318-CC3318	Injection Date:	08/27/14
Lab File ID:	BB59390.D	Injection Time:	15:07
Instrument ID:	GCBB	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	4.24	4.23

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
MC33045-1	BB59391.D	08/27/14	15:31	4.24	4.23
ZZZZZZ	BB59392.D	08/27/14	15:56	4.24	4.23
ZZZZZZ	BB59393.D	08/27/14	16:20	4.24	4.23
ZZZZZZ	BB59394.D	08/27/14	16:45	4.24	4.23
GBB3318-ECC331	BB59395.D	08/27/14	17:09	4.24	4.23

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.4

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GYZ7636-ICC7636	Injection Date:	09/03/14
Lab File ID:	YZ91620.D	Injection Time:	17:51
Instrument ID:	GCYZ	Method:	SW846 8011

	S1 [a] RT	S1 [b] RT
Check Std	3.30	3.51

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
OP39646-MB	YZ91624.D	09/03/14	19:08	3.29	3.51
OP39646-BS	YZ91625.D	09/03/14	19:27	3.30	3.51
OP39646-MS	YZ91626.D	09/03/14	19:47	3.29	3.51
OP39646-MSD	YZ91627.D	09/03/14	20:06	3.30	3.51
MC33200-2	YZ91628.D	09/03/14	20:25	3.29	3.51
MC33045-2	YZ91629.D	09/03/14	20:44	3.30	3.51
MC33045-4	YZ91630.D	09/03/14	21:03	3.30	3.51
ZZZZZZ	YZ91631.D	09/03/14	21:22	3.29	3.51
ZZZZZZ	YZ91632.D	09/03/14	21:42	3.30	3.51
GYZ7636-ECC7636	YZ91633.D	09/03/14	22:01	3.30	3.51

Surrogate Compounds

S1 = Bromofluorobenzene (S)

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.5

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GAB4558-CC4488	Injection Date:	08/28/14
Lab File ID:	AB85641.D	Injection Time:	07:26
Instrument ID:	GCAB	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std		20.32

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GAB4558-MB	AB85642.D	08/28/14	08:04		20.32
GAB4559-MB	AB85642A.D	08/28/14	08:04	20.32	20.32
GAB4558-BSP	AB85643.D	08/28/14	08:42		20.32
GAB4559-BSP	AB85643A.D	08/28/14	08:42	20.32	20.32
GAB4558-BSD	AB85644.D	08/28/14	09:21		20.32
GAB4559-BSD	AB85644A.D	08/28/14	09:21	20.32	20.32
ZZZZZZ	AB85645.D	08/28/14	10:00		20.32
MC33045-2	AB85646.D	08/28/14	10:38		20.32
MC33192-2	AB85647.D	08/28/14	11:16		20.32
MC33192-2MS	AB85648.D	08/28/14	11:54		20.32
MC33192-2MSD	AB85649.D	08/28/14	12:32		20.32

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.6

GC Surrogate Retention Time Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Check Std:	GWX3651-CC3510	Injection Date:	08/27/14
Lab File ID:	WX74950A.D	Injection Time:	09:37
Instrument ID:	GCWX	Method:	SW846 8015

	S1 [a] RT	S1 [b] RT
Check Std		19.95

Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed	S1 [a] RT	S1 [b] RT
GWX3651-MB	WX74951A.D	08/27/14	10:14		19.95
GWX3650-MB	WX74951.D	08/27/14	10:14	19.95	19.95
GWX3650-BSP	WX74952.D	08/27/14	10:51	19.95	19.95
GWX3651-BSP	WX74952A.D	08/27/14	10:51		19.95
GWX3651-BSD	WX74953A.D	08/27/14	11:29		19.95
GWX3650-BSD	WX74953.D	08/27/14	11:29	19.95	19.95
ZZZZZZ	WX74954.D	08/27/14	12:06	19.95	19.95
MC33045-1	WX74955.D	08/27/14	12:44		19.95
MC33045-1MS	WX74956.D	08/27/14	13:22		19.95
MC33045-1MSD	WX74957.D	08/27/14	14:00		19.95
ZZZZZZ	WX74958.D	08/27/14	14:38		19.95
ZZZZZZ	WX74959.D	08/27/14	15:16		19.95
ZZZZZZ	WX74960.D	08/27/14	15:54		19.95

Surrogate Compounds

S1 = 2,3,4-Trifluorotoluene

(a) Retention time from GC signal #2
(b) Retention time from GC signal #1

8.6.7

New England ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Percent Solids Raw Data Summary

Percent Solids Raw Data Summary

Job Number: MC33045
Account: SHELLWIC Shell Oil
Project: URSMOSTL: Roxana 4th St. Extension Well Instal, 900 South Central Ave, Roxana,IL

Sample: MC33045-1 Analyzed: 22-AUG-14 by HS Method: SM21 2540 B MOD.
ClientID: SVE44-082014(30-36')

Wet Weight (Total)	35.751	g
Tare Weight	24.765	g
Dry Weight (Total)	35.375	g
Solids, Percent	96.6	%

KORTE & LUITJOHAN Contractors, Inc.

Hydrostatic Pressure Test Report

Test Date: 10/16/14 NORTH OF

Start Time: 2:00 pm FOURTH ST

End Time: 3:15 pm

Method: AIR

Pipe Testing: HDPE

Result: 10 PSI

Customer: Shell Oil Products US

Job Name: SVE Conveyance System Extension East 4th and Chaffer Streets, Roxana, Illinois

This is to certify that the material and processes used to manufacture the above described product meet the specifications set forth in Section 03000 - System Piping (2.4.A - Testing) of the SVE System Extension bid documents.

Keith Albers

Korte & Luitjohan Contractors, Inc.

KORTE & LUITJOHAN Contractors, Inc.

Hydrostatic Pressure Test Report

Test Date: 10/21/14 SOUTH OF

Start Time: 1:00 pm FOURTH ST

End Time: 2:15 pm

Method: AIR

Pipe Testing: HDPE

Result: 10 PSI

Customer: Shell Oil Products US

Job Name: SVE Conveyance System Extension East 4th and Chaffer Streets, Roxana, Illinois

This is to certify that the material and processes used to manufacture the above described product meet the specifications set forth in Section 03000 - System Piping (2.4.A - Testing) of the SVE System Extension bid documents.

Keith Albers

Korte & Luitjohan Contractors, Inc.

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE AB-1 SVE PIPING NEAR 4TH AND CHAFFER STREETS.DWG Last edited: DEC. 15, 14 @ 4:07 p.m. by: david_deguire

LEGEND

- 4TH STREET EXTENSION SVE WELL
- EXISTING SHALLOW SVE WELL
- EXISTING DEEP SVE WELL
- VAPOR MONITORING POINT LOCATION
- CPT/ROST LOCATION
- SVE PIPING EXTENSION (UNDERGROUND) SHOWING DIRECTION OF SLOPE
- PROPERTY BOUNDARY
- EXISTING BLUE LINE
- EXISTING BLUE LINE (UNDERGROUND)

SVE Well Coordinates/Elevations

Well ID	Northing	Easting	TOC Elevation
SVE-42	793428.34	2322228.28	441.37
SVE-43	793428.73	2322147.36	441.35
SVE 44	793332.43	2322146.79	441.53
SVE-45	793340.07	2322208.17	441.39
SVE 46	793260.69	2322209.79	441.85
SVE 47	793164.39	2322212.17	443.03

Coordinate information based on the Illinois State Plane Coordinate System - West Zone NAD83 (2007)

NATURAL GAS
OVERHEAD ELECTRIC
SEWER
OHE
G
VMP-49
GRAVEL ALLEY
VMP-3
ROST-5
ROST-32
SVE-43
SVE-42
ROST-31
D7 D8 TYPICAL WELLHEAD AND TRENCH DETAIL
EXISTING GARAGE
ROST-33
ROST-34
ROST-35
CONCRETE WALK
FENCE
SVE-29
SVE-8
SVE-30
SVE-9
ROST-36
ROST-37
SVE-45
SVE-44
WATER
VMP-56
D1 D2 D3 D4 CONNECTED TO EXISTING 4" PVC IN SVE-3R/ SVE-25 WELL VAIULT
WV
FH
VMP-32
SVE-4
SVE-3R
VMP-43
SVE-25
SVE-31
FOURTH ST
CONNECTED TO EXISTING BLUE LINE HEADER
D5 D6
ROST-8
WM
SVE-46
ROST-38
SVE-10
VMP-26
ROST-39
VILLAGE OF ROXANA
ROST-40
SVE-1
ROST-41
SVE-32
ROST-42
NATURAL GAS
SVE-47
VMP-4
VMP-50
ROST-9
GRAVEL ALLEY
SEWER
SVE-11
VMP-28

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO. 21563720

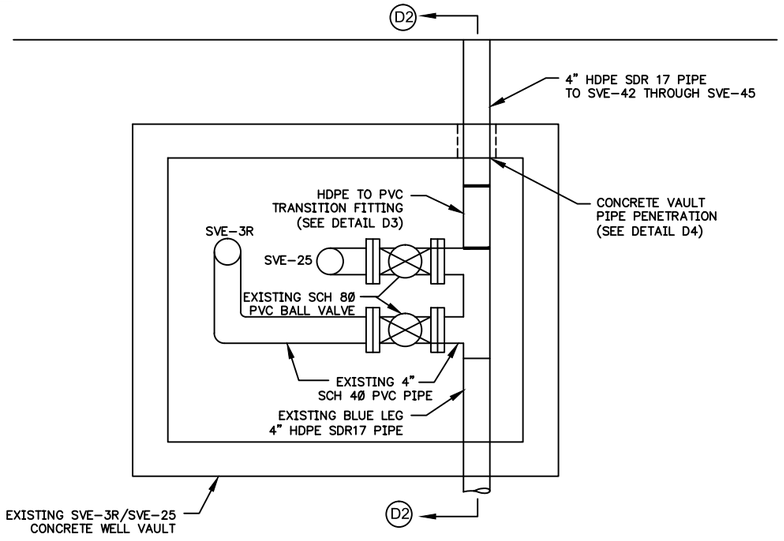
URS

DRN. BY: djd November 2014
DSGN. BY: ekf
CHKD. BY: ekf

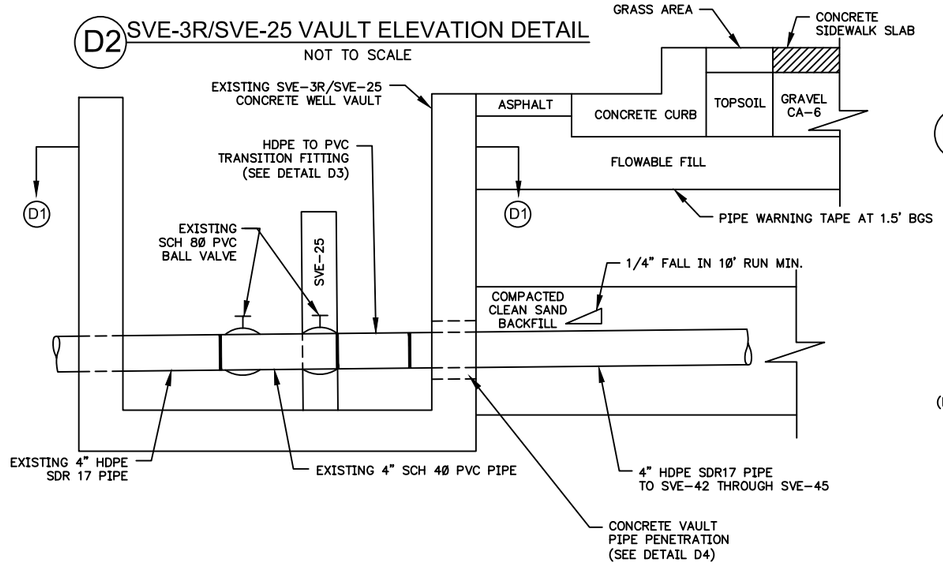
As-Built SVE Extension Piping Near 4th & Chaffer Streets

FIG. NO. AB-1

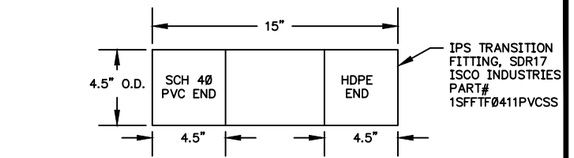
0 30
SCALE FEET
N



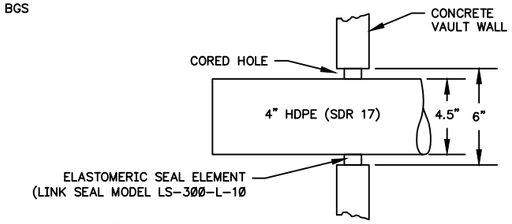
SVE-3R/SVE-25
D1 VAULT PLAN VIEW
NOT TO SCALE



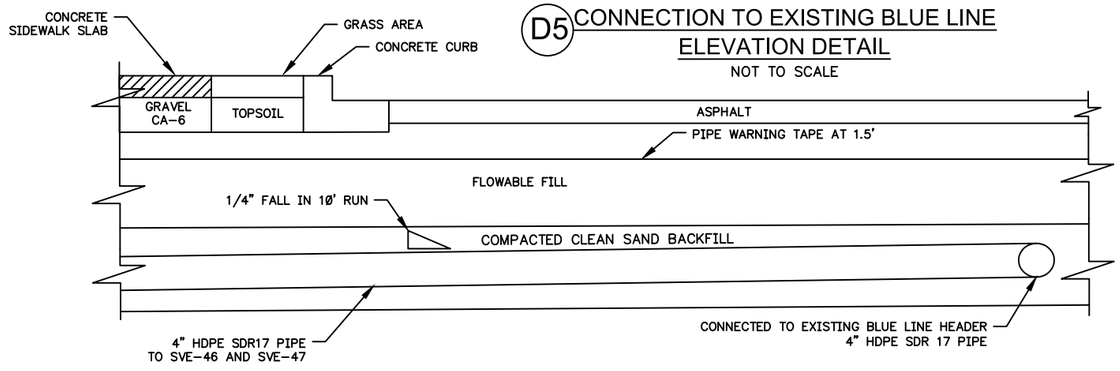
D2 SVE-3R/SVE-25 VAULT ELEVATION DETAIL
NOT TO SCALE



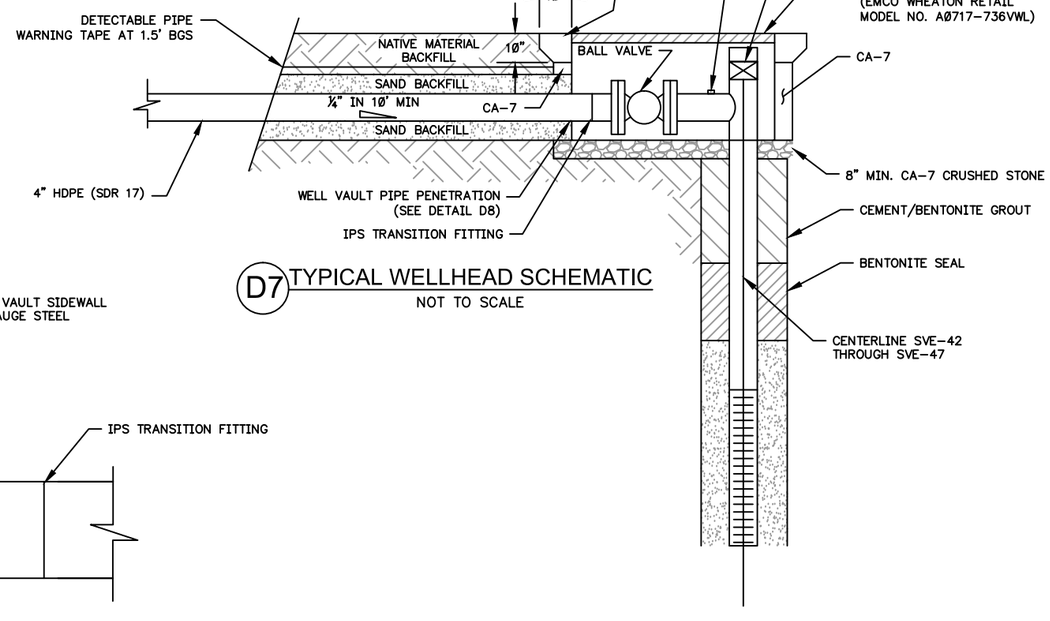
D3 HDPE TO PVC TRANSITION FITTING
NOT TO SCALE



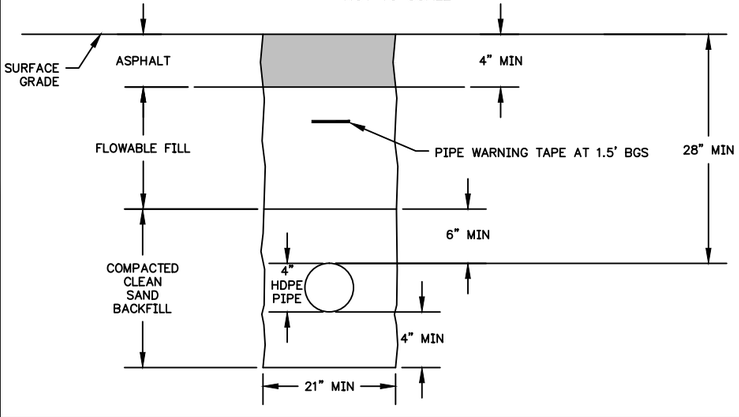
D4 CONCRETE VAULT PIPE PENETRATION DETAIL
NOT TO SCALE



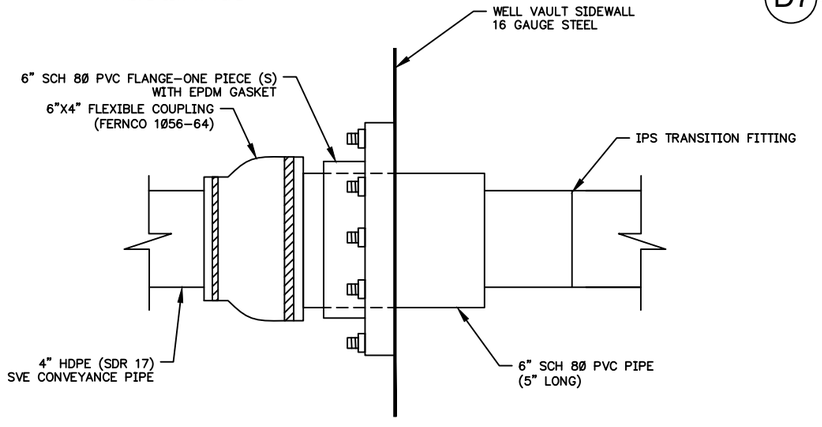
D5 CONNECTION TO EXISTING BLUE LINE ELEVATION DETAIL
NOT TO SCALE



D7 TYPICAL WELLHEAD SCHEMATIC
NOT TO SCALE



D6 EAST FOURTH ST. RIGHT-OF-WAY PIPE TRENCH DETAIL
NOT TO SCALE



D8 TYPICAL WELL VAULT PIPE PENETRATION DETAIL
NOT TO SCALE

SHELL OIL PRODUCTS US ROXANA, ILLINOIS	PROJECT NO. 21563720
URS	
DRN. BY: djd November 2014 DSGN. BY: ef CHKD. BY: ef	As-Built SVE Piping and Wellhead Details
	FIG. NO. AB-2

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\17-SVE SYSTEM EXTENSION\CONSTRUCTION COMPLETION REPORT\FIGURES\FIGURE AB-2 PIPING AND WELLHEAD DETAILS.DWG Last edited: DEC. 15, 14 @ 4:09 p.m. by: david_deguire

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
1	9/23/14

Description:

Trench excavation on North property. Photo taken looking north.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
2	9/23/14

Description:

Trench excavation on North property. Photo taken looking west. SVE-42 is visible in the foreground.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
3	9/24/14

Description:
North property showing perimeter security fence and trenches covered with plywood.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
4	10/20/14

Description:
SVE-46 vault prior to connection of SVE-46 to HDPE pipe. Photo taken looking south.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
5	10/21/14

Description:
HDPE pipe placed in trench on South property. Photo taken looking south. SVE-46 is visible in middle portion of photograph.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
6	10/21/14

Description:
SVE-46 prior to completing all pipe connections.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
7	10/15/14

Description:
SVE-42 with completed pipe connections.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
8	10/21/14

Description:
SVE-47 immediately prior to performing pressure test.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
9	10/21/14

Description:
Pressure test monitor gauge at SVE-47.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No.	Date:
10	10/21/14

Description:
Pressure test hose and pressure monitor gauge at SVE-42.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 11 | **Date:** 10/16/14

Description:
HDPE pipe penetration at the existing concrete vault containing wells SVE-3R and SVE-25.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 12 | **Date:** 10/21/14

Description:
HDPE pipe layout at location where South property HDPE pipe was connected to existing blue line HDPE. Photograph taken looking north.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 13 | **Date:** 10/22/14

Description:
Flowable fill placed where excavation crossed the sidewalk and 4th Street. Photograph taken looking north.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 14 | **Date:** 10/24/14

Description:
SVE-45 following completion of all construction and site grading activities. All repairs to 4th street and sidewalks are complete in this photo. Grass seed has been applied, and contractor is in process of preparing to apply straw cover. Photograph taken looking south.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 15 | **Date:** 10/24/14

Description: North property following completion of all construction activities, seeding, and placement of straw cover.

URS

4TH STREET SVE SYSTEM EXTENSION PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Shell Oil Products US	Roxana, Illinois	21562973.19000

Photo No. 16 | **Date:** 10/24/14

Description: South property following completion of all construction activities, seeding, and placement of straw cover.

SVE OPERATIONS AND MAINTENANCE PLAN

WRB REFINING LP
WOOD RIVER REFINERY
& ROXANA PUBLIC WORKS SITE
ROXANA, ILLINOIS

Prepared for
Shell Oil Products US
17 Junction Drive
PMB#39
Glen Carbon, IL 62034

Rev. 5
December 4, 2014

URS Corporation
1001 Highland Plaza Drive West, Suite 300
St. Louis, MO 63110
(314) 429-0100
Project # 21562973

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ADMINISTRATIVE INFORMATION

Client Name: ..... Shell Oil Products US

Site Name ..... WRB Refining LP – Wood River Refinery

Site Location: ..... Roxana, Illinois

URS Task Manager ..... George Jones

URS Project Manager ..... Nick Eldred

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APPROVAL:

URS Task Manager — Date: 12/8/2014

URS Project Manager — Date: 12/8/2014

URS Operator — Date: 12/8/2014

REVISIONS

Rev. #	Date	Name/Company of Reviewer	Section	Revision
1	1/16/12	URS St. Louis/Overland Park	All	General update based on fully installed system
2	4/26/12	URS St. Louis	All	General update based on operating system
3	5/13/13	URS St. Louis	All	General update based on operating system
4	07/11/14	URS St. Louis	All	General update based on operating system
5	12/4/14	URS St. Louis	All	General update based on operating system

SECTIONONE Introduction

This Operation and Maintenance Plan (O&M Plan) has been prepared by URS Corporation (URS), on behalf of Shell Oil Products US (SOPUS) for the Soil Vapor Extraction (SVE) system located near the northwest corner, along the west property boundary (a/k/a west fenceline) within the fenced boundary of the WRB Refining LP, Wood River Refinery (WRR) located at 900 South Central Avenue, Roxana, Illinois. The SVE system piping and SVE wells are positioned parallel along the WRR west fenceline and Chaffer Street. Additional SVE wells and piping are located along Fourth Street in Roxana, in vacant properties, located adjacent to the intersection of Fourth Street and Chaffer Avenue in Roxana, and at the Village of Roxana Public Works Yard (Public Works) located at South Chaffer Avenue and East 8th Street in Roxana. The purpose of this Plan is to provide general guidance for the operation, preventative maintenance, troubleshooting, and performance monitoring of the SVE wells and Vapor Monitoring Points (VMPs) associated with the SVE system.

The SVE system and corresponding vapor distribution in the WRR and Public Works vicinity is dynamic therefore, this plan will be modified as operational conditions change. Some of these changes include, but are not limited to:

- Equipment, which may result in changes to routine maintenance,
- Monitoring frequency,
- Monitoring locations, and
- Monitoring procedures, including eliminating the need for venting prior to collecting measurements at VMP locations,

As this plan is updated, records will be maintained of the changes and the revision page of this plan will be updated. The remainder of this Plan is divided into seven sections.

- **Section 2.0** presents a staffing list of those involved in the project.
- **Section 3.0** presents of description of all the major components of the SVE system.
- **Section 4.0** addresses the steps required in a full-scale startup and shutdown of the SVE system.
- **Section 5.0** discusses routine maintenance, troubleshooting, and spare parts inventory for the vapor extraction blower, VLS, and RTO.

- **Section 6.0** discusses monitoring and sampling of the SVE system, included permit required sampling.
- **Section 7.0** discusses system monitoring and reporting.

SECTION TWO Staffing

A list of the people involved in this project is provided in the table below.

Project Team

NAME	COMPANY	PROJECT TITLE	CONTACT NUMBERS
Kevin Dyer	Shell Oil Products US	Program Manager - Client	618-288-7237
Eric Peterson	ConocoPhillips	RM&R Manager – Property Owner	618-255-3190
Nick Eldred	URS Corporation	Project Manager	314-743-7753
George Jones	URS Corporation	Task Manager	314-422-2793
Rich Hart	URS Corporation	SVE Assistant Task Manager	636-448-2734
Steve Wipfler	URS Corporation	SVE System Operator	314-619-1876
Phillip Wood	Maple Leaf Equipment	Project Remedial Equipment Engineer	800-420-4056
Greg Blando	Anguil Environmental	Project Thermal Oxidation Engineer	414-365-6400

It should be noted that the most important aspect of carrying out this plan is doing so under the direction of the Shell Site Health and Safety Plan for the WRR Site and under all conditions required by ConocoPhillips (COP). Violations of the Health and Safety Plan or COP policy will warrant immediate expulsion from the project and the COP property.

SECTION THREE SVE System Components

3.0 SOIL VAPOR EXTRACTION SYSTEM (SVE) COMPONENTS

3.1 SVE SYSTEM OVERVIEW

The West Fenceline portion of the SVE system utilizes 39 extraction wells (SVE-3R through SVE-20, SVE-25, SVE-28 through SVE-47) with an additional six extraction wells (SVE-21 through SVE-24, SVE-26, and SVE-17) located on the Public Works property (**Figure 1**). The active SVEs are plumbed through six header lines that are both underground and aboveground. The piping leads to the remediation equipment which consists of a vapor extraction blower, two vapor liquid separators (VLSs) with associated aboveground storage tanks (ASTs), a regenerative thermal oxidizer (RTO), and a control room (**Figure 2**). A steel shipping container has been adapted to house the vapor extraction blower and VLSs in one room and controls and a backup air compressor in another room. The steel shipping container and RTO are located on a concrete pad at the south end of the west fenceline within the WRR. An additional steel shipping container located west of the original unit has been adapted to house a rotary screw air compressor, storage room, and office space (**Figure 2)**. As-built drawings for the SVE System can be found in **Appendix A**.

3.2 WELLS

Soil vapor to the SVE system can be supplied by 45 extraction wells with varying screen depths and associated piping. A network of VMPs is utilized by personnel to monitor the zone of influence of vacuum created by the system and soil vapor concentrations in the surrounding soils.

3.2.1 Extraction Wells

At present there are a total of 45 extraction wells that can provide soil vapor to the SVE system. This total includes 30 wells within the WRR, three wells (SVE-3R, SVE-4, and SVE-25) located on E. 4th Street and six wells (SVE-42 through SVE-47) located on vacant property at Fourth Street and Chaffer Avenue in the Village of Roxana, and six SVE wells at the Public Works site. SVE extraction well locations are illustrated on **Figure 1**. Generally, these wells are constructed of 4-inch PVC and are screened at various depths above the typical water table. Specific well construction information is provided on **Table 1**.

The extraction wells are connected to the SVE system through a series of six header lines or legs, which are controlled by independent valves. In addition to being able to control flow from each

leg of extraction wells, valves are installed at each extraction well to allow control at individual wells. Extraction wells also include sample and access ports to allow the collection of vapor samples, vacuum readings, and measurement of fluid levels. In addition to the active lines, two spare header lines on the west fenceline leg, and one spare header line on the Public Works leg were installed for potential expansion of the system or to allow additional dilution air if needed. The lines are positioned through the roof of the north end of the system building into the open air. Procedures and frequency for extraction well sampling and monitoring are presented is **Section 6.1**.

3.2.2 VMP Wells

In addition to the extraction wells, URS personnel utilize a network of 63 VMP wells. Each VMP generally consists of either three or four individual wells screened at designated intervals above the typical water table. The VMPs are designed to facilitate vacuum measurements at varying subsurface intervals. Vacuum measurements and VOC concentrations in soil vapor samples collected from the VMP wells are used to evaluate the efficiency of the SVE system. VMP locations are illustrated on **Figure 1**. The majority of the VMPs are constructed of 0.125-inch diameter stainless steel terminating at ground surface with fittings to accommodate the collection of soil vapor samples and vacuum readings. Five VMPs, VMPs 26 through 30, are constructed of 0.5-inch polyvinyl chloride piping. Specific well construction information is provided on **Table 1B**. Procedures and frequency for VMP well sampling and monitoring is presented is **Section 6.2**.

3.3 EXTRACTION SYSTEM

The extraction portion of the SVE system includes a vapor extraction blower, two VLSs, two transfer pump, one baffle tank, and two ASTs.

3.3.1 Vapor Extraction Blower

Electrical components of the blower are constructed to comply with National Electrical Code (NEC) Class 1 Division 2 standards inside the Process Room and general purpose, unclassified inside the Control Room. The extraction system consists of the following equipment:

- Sutorbilt vacuum blower with a design capacity of 2,370 cubic feet per minute (cfm) at an inlet vacuum of 27 inches of water column (in. wc)
- 40 HP, explosion proof, 3 phase, 460 volt, 1800 rpm motor

- Blower inlet piping with vacuum gauge, vacuum relief valve, and sample port
- Six-inch diameter manual dilution valve with vacuum gauge and air filter (or equivalent)
- Differential vacuum gauges to measure the differential pressure across the filter element
- Discharge piping with a silencer, sample port, pressure gauge, and temperature gauge
- Programmable Logic Controller (PLC)-based control System with control panel, circuit breakers, and remote telemetry and communications system. The blower PLC control panel transmits data to a computer in the control room that logs and displays operational parameters of the systems.

Detailed information on the vapor extraction blower can be found in **Appendix B**.

3.3.2 Vapor Liquid Separators (VLSs)

In order to remove any liquid from the vapor stream prior to entering the blower, the extraction system includes two 240-gallon VLSs. One VLS is connected to the extraction wells associated with the Public Works area and the second VLS is connected to the extraction wells associated with the west fenceline and the village of Roxana. If present, condensate will collect in the bottom of the VLS while the air exits the discharge pipe in the top of the VLS.

Each VLS is equipped with a high level alarm float switch, high and low level pump control switches, a bottom manual drain valve, and a dedicated transfer pump. The bottom drains on the VLSs have been plugged to prevent accidental draining. The transfer pumps are powered by 1 HP, explosion proof, 460 volt, 3 phase motors rated for 40 gallons per minute (gpm) at 40 feet total dynamic head with pressure gauges and gate valves. If the high level pump control switch is activated, the transfer pumps will move any accumulated condensate to the ASTs. Detailed information on the VLS units and associated equipment is included in **Appendix E**.

3.3.3 Aboveground Storage Tanks (ASTs)

Any accumulated condensate from the VLSs will be pumped into the two 630-gallon ASTs. The ASTs have been RCRA certified (**Appendix P**). Each double walled steel AST is equipped with:

- High level alarm float switches
- Elevated vent

- Emergency vent
- Heat trace tape and insulation with the thermostats attached to the outside of the system building
- In addition, each AST has a high-high level alarm. If the liquid level in the AST reaches the high-high set point, the SVE System is shutdown to avoid overfilling of the ASTs.

3.4 REGENERATIVE THERMAL OXIDIZER

The RTO consists of two combustion chambers and burners with a tertiary and combustion air blower, temperature and pressure sensors, fuel control system, and main PLC based control panel.

Recovered soil vapors are mixed with atmospheric (combustion) air provided by the combustion blower and natural gas (if required) in the burner, and the mixture is then ignited. The inlet (cold face), outlet (stack) and combustion chamber temperatures are monitored and displayed on the Human Machine Interface (HMI). The amount of natural gas (if any), and/or ambient air added is automatically controlled to maintain operating temperatures. If the hydrocarbon concentrations in soil vapors are sufficiently high and the combustion chamber temperature exceeds a pre-determined temperature (1550^{O} F), additional atmospheric air is automatically introduced into the combustion chamber by means of the tertiary blower and/or dilution air dampers near the "mixing box". If internal chamber temperatures exceed the preset limit (1850^{o}F), a high chamber temperature alarm will be triggered and the system will shut down. Supplemental fuel and dilution air is controlled by a PLC-based control panel and the control panel PLC is connected via Ethernet cable to the main computer in the control room through a router. Data collected by the PLC is logged on the computer and displayed on the HMI. Dilution air may also be introduced into the RTO by manual means, utilizing the manual dilution valve adjacent to the blower or the three supplementary dilution lines installed at the header.

Typical vapor destruction efficiencies are over 95 percent. After treatment in the RTO the exhaust gas is directed to the atmosphere through a velocity duct exhaust stack which terminates approximately 35 feet above ground surface. The stack temperature is monitored and displayed on the HMI. If stack temperatures exceed the preset limit (725^{o}F), a high stack temperature alarm will be triggered and the system will shut down.

Detailed information on the RTO unit can be found in **Appendix C**.

SECTION THREE SVE System Components

3.5 SVE SYSTEM CONTROL

The Control Room of the SVE system is located in the south end of the divided system building. The control room portion of the system building contains a backup air compressor, the breaker boxes, and the main computers. All operation monitoring interface components for the SVE system are within the control room.

A steel shipping container has been positioned west of the Control Room/Process Room. The shipping container has been adapted to house a rotary screw air compressor, storage room, and office space.

3.5.1 PLCs and Data Logging

The individual PLCs are connected to the main computer in the control room which provides all data logging, alarm logging, and the HMI. The computer is equipped with an un-interruptible power supply (UPS) that will provide backup power in the event of a power outage. Detailed information on the PLC configuration and programming, data logging and remote data transfer is included in **Appendix D.**

After initial installation, the SVE system underwent system commissioning. As part of the commissioning, the SVE blower and RTO were tested under simulated operating conditions. The initial system startup period was used for testing and verification of proper operation of the individual system components, control logic, alarms, final programming of the PLC and overall system function. The initial system startup period was implemented with ambient air. The same procedures should be followed after any prolonged shutdown period.

4.0 FULL SCALE SVE OPERATION

4.1 VAPOR EXTRACTION OPERATION

The SVE blower will not operate without the RTO. When the Hand-Off-Auto (HOA) switch for the blower is in the Auto position, operation of the blower is controlled by the RTO. The blower can be operated independently from the oxidizer in the Hand position for testing purposes only when using ambient air.

4.1.1 Vapor Extraction Blower Startup

Prior to starting of the blower the following procedures need to be followed:

1. Check all fluids for the blower system
2. Check tension and wear on the belts
3. Make sure personnel are clear of all moving parts
4. Implement noise abatement PPE
5. Push the Reset Button on the operator interface to reset all alarms
6. Check the position of all valves and open the bleed-air valve
7. Check that the main disconnect is on
8. Put all hand/off/auto switches in auto
9. Start up the RTO
10. The SVE blower and motor should become operational when the RTO has reached operation temperature based on initial vapor concentrations

4.1.2 Vapor Extraction Blower Adjustments

During operation of the blower, the outlet temperature, blower vacuum, discharge pressure, and discharge flow are parameters that are monitored. The discharge temperature, inlet vacuum, and discharge pressure should not exceed the manufacturer's specifications as provided in **Appendix B**.

4.2 RTO OPERATION

4.2.1 RTO Startup

Soil vapors and natural gas (if necessary) are introduced into the combustion chamber and burned in a controlled environment. There are several safety interlocks on the oxidizer, but the operator should realize at all times that improper operation of the RTO can result in an explosion, damage to the oxidizer, and serious injury or death.

When the oxidizer is started it controls the blower if it is in the Auto position. Startup of the oxidizer is automated but steps to follow immediately before startup are described below.

During startup of the oxidizer, the HOA switch for the blower will be placed in the Auto position. When the Start button on the oxidizer control panel is pushed the RTO will follow programmed steps during startup. Once the temperature of the RTO is stable, the extraction system will be brought on line to begin recovery of soil vapor.

4.2.2 RTO Adjustments

System adjustments can be achieved through valve adjustment at the header inlet or at individual SVE well locations depending on localized hydrocarbon concentrations.

Specific technical information including manufacturers operation and maintenance manuals and step-by-step procedures for startup, maintenance and operation for the oxidizer are included in **Appendices J and K**.

4.3 SVE SYSTEM SHUTDOWN

A controlled shutdown of the system is achieved by pressing the STOP push-button on the HMI in the SVE system control room. This will initiate an automated timed sequence whereby the flow of soil vapor into the RTO will stop and the RTO will begin a cool down period in association with valve shutdown.

4.4 EMERGENCY SHUTDOWN

If immediate shutdown of the individual oxidizer/blower systems or the entire SVE is necessary or desired, the following procedure should be followed:

1. Push one of the labeled **SVE Emergency Stop** buttons located directly inside the Control Room and Process Room man doors.

2. Push one of the labeled **RTO Emergency Stop** buttons located on the Control Room RTO control panel or on the south end of the RTO unit.
3. Turn off the labeled **Main Breaker** at the electrical panel located along the east wall of the Control Room
4. Turn off the labeled **Gas Shut-Off Valve** at the gas meter located along the west fence line.
5. Notify URS emergency contacts immediately:

Primary Contact:	**George Jones**	**314-422-2793**
Secondary Contact	**Rich Hart**	**636-448-2734**

SECTION FIVE Maintenance

5.0 MAINTENANCE

5.1 VAPOR EXTRACTION BLOWER

This section provides a summary of routine maintenance, troubleshooting, and a recommended inventory of spare parts for the vapor extraction blower system. Specific technical information relating to the maintenance of the system is included in **Appendix G**. The maintenance should only be conducted by a qualified individual.

5.1.1 Routine Maintenance

A detailed routine maintenance schedule organized by operating hours is presented as **Appendix G.**

5.1.2 Troubleshooting

Specific technical information relating to the troubleshooting of the blower system is included in **Appendix H**.

5.1.3 Spare Parts Inventory

Certain spare parts should be kept in inventory to be used for preventative maintenance and available to eliminate extended down time. A comprehensive list of spare parts and model numbers is provided in the Manufacturer's literature in **Appendix I**.

5.2 RTO SYSTEM

This section provides a summary of routine maintenance, troubleshooting, and a recommended inventory of spare parts for the RTO system. Specific technical information relating to the maintenance of the system is included in **Appendix K**. RTO troubleshooting and maintenance should only be conducted by a qualified individual.

5.2.1 Routine Maintenance

Recommended routine maintenance of the RTO system is detailed in **Appendix K.**

5.2.2 Troubleshooting

Specific technical information relating to the troubleshooting of the RTO systems is included in **Appendix L**.

5.2.3 Spare Parts Inventory

Certain spare parts should be kept in inventory to be used for preventative maintenance and to be available for alarm shutdown situations. A comprehensive list of parts and model numbers is provided in the Manufacturer's literature in **Appendix M**.

5.3 VLS System

5.3.1 Routine Maintenance

Manufacturer instructions for routine maintenance of the VLS system are provided in **Appendix G**. Instructions include:

- Check for accumulated sediment within seven days of making an adjustment to the manual dilution valve. Clean accumulated sediment at least quarterly or on an as needed basis.
- Clean the float switches on the VLS tanks at least monthly or more frequently whenever condensate is accumulating.
- Clean each VLS sight glass when buildup of debris prevents observations from being made.
- Monitor the pressure difference before and after VLS filter housing. Check condition of VLS filters at least every 336 hours (every 14 days). Change VLS filters when pressure difference is 8-inch of water column or greater, minimum of every 800 hours (every 33 days), or when there is evidence of excessive filter loading.

Any sediment that has collected will be containerized in a drum and analyzed for the parameters set by the Shell-approved disposal company. The sediment will be disposed based on the analytical data for the sample. The Specific technical information relating to the maintenance of the system is included in **Appendix G**.

5.3.2 Spare Parts Inventory

A summary of the recommended spare parts to keep in inventory, manufacturer/supplier, model number, are provided on **Appendix I**.

5.3.3 Condensate Management

Water recovered (if any) by the SVE system is referred to as condensate. The water may potentially originate as moisture in the recovered soil vapor. This water may be vacuumed into

the system piping and accumulate in low areas of the piping. The velocity of air moving through the piping should transport this water to the SVE treatment area, where it would be recovered by the Condensate Management System (CMS).

On occasion, water may be trapped within the low areas of system piping, causing deviations to system vacuum and/or flow. This occurrence is often detected when vacuum readings at individual wells are surging. When this occurs, the individual system piping will be cleared of water by either shutting off the vacuum at the individual well allowing accumulated water to flow back to the well or by removing the furthest well cap from the RTO on a specific transfer line and allowing the excess air flow to push the accumulated water toward the CMS. Another way to clear water from an individual line is to temporarily shut off flow from individual lines which applies additional vacuum to the lines which are open causing the condensate to flow to the VLS unit.

Condensate management includes the monitoring of water accumulation in, and transfer from, the VLSs to the ASTs. Any water collected in the ASTs will be sampled and determination will be made if wastewater is designated hazardous or non-hazardous. The site's investigative derived waste (IDW) manager will coordinate sample collection and review the analytical results to ensure that the waste stream is properly managed. If found to be hazardous, wastewater will be transported within 90 days of the accumulation start date to a designated treatment facility. If found to be non-hazardous, wastewater will be transported to an alternate treatment facility when the liquid is within 1 foot of the top of the tank, or within 90 days whichever occurs first. The IDW manager will coordinate with the waste hauler for proper disposal. An existing profile for disposal has been prepared for management of the condensate generated from the Public Works leg of the system. Additional testing of this water is not needed unless requested by the disposal facility. The condensate generated from the West Fenceline leg of the system is managed at the Conoco Phillips NPDES permitted wastewater treatment plant. Conoco Phillips requires that each load of condensate from the West Fenceline portion of the system be analyzed prior to being managed at their facility. A sample must be collected from the tank and analyzed in time for proper management. Typically, the sample is collected when the tank is half full. However, based on the accumulation rate, the sample may need to be collected earlier.

The condensate water from the West Fenceline AST can be pumped to 55-gallon drums staged on a spill pallet if the West Fenceline analytical results are not received in time. The drums must be labeled similar to the West Fenceline AST. Generally, the Public Works AST fills at a slower

rate than the West Fenceline AST. At this time, each load fro the Public Works AST does not require independent analytical results. As such, it should not be necessary to pump water from the Public Works AST into 55-gallon drums as timely pick up should be arranged for. However, if water from the Public Works ASTs needs to be temporarily staged in 55-gallon drums additional drums will need to be obtained.

5.3.4 Inspections

As part of the record of operation and to ensure the proper operation of the SVE System equipment, regular inspections of System components are to be conducted. Copies of SVE System inspection sheets can be found in **Appendix Q**.

5.3.5 Routine Maintenance Activities

5.3.5.1 Data Recorder

A data recorder associated with the RTO control panel records chamber temperatures and cold face temperatures every minute. In order to ensure that data is not lost, the data card is switched out on a monthly basis. The data recorder is located within the control panel which is powered by both 120 and 480 voltage. Because of its location, anyone who opens the RTO Control panel has the potential to be exposed to electrical arc flash. For this reason, the site operator and anyone else who opens the RTO control panel is required to complete URS' learning management system (LMS) modules for electrical safety and be informed of the site specific electrical hazards. In addition, entry into the control panel requires the use of personal protective equipment (PPE) to protect against the hazards associated with arc flash. The protective equipment includes: fire rated shirt and pants, or coveralls; hardhat which is rated for electrical hazards; work boots which are rated for electrical hazards; fire rated sock hood, class 00 lineman gloves with leather protectors, and a fire rated face shield.

5.3.5.2 800-Hour Maintenance

Certain maintenance activities are to be completed every 800 hours (33 days) of operation. These include checking and replacement if necessary of system filters: VLS intake filters, blower air filter, combustion fan filter, and air compressor filter. The floats systems associated with the VLS units are to be cleaned with a soapy water spray once per month. These tasks may need to be conducted more frequently based on the condition of the filter units and float systems.

5.3.5.3 Nine Minute Poppet Valve Test

In order to verify that the poppet valves are properly seating, URS conducts a monthly 9-minute test of the poppet valve system. A Gast high flow air sampling pump is attached to the vacuum port located on the RTO stack using Tygon tubing. The sampling begins when the poppet valves switch, which occurs approximately every three minutes. A sample is collected from the exhaust during the initial poppet valve change, 30 seconds after the poppet valve change, and 2 minutes after the poppet valve change. The samples are collected during three consecutive poppet valve changes. Typically, the screening results should show that a "puff" of VOCs is detected immediately after the poppet valve change. The screening results for the subsequent samples will typically be expected to be of low concentration. If screening results of the 30 second and 2 minute samples are elevated this indicates that the poppet valves are not seating properly and repair or an adjustment to the poppet valve may be needed.

5.3.5.4 Pumping of Vaults

Rainwater can accumulate within the below ground well vaults. In order to prevent corrosion and damage to system equipment, the rain water should be removed from the underground vaults at least on a monthly basis. The water can be pumped to surrounding soils as long as there is no evidence of petroleum sheen. If sheen is identified, then the rainwater shall be containerized and properly managed.

5.3.5.5 Belt Replacement

The blower system and external combustion fan both utilize belts in their operation. The belts should be visually checked for wear every 14 days. If loose the belts should be tightened as needed. The belts shall be changed when conditions warrant or annually based off manufacturer's instructions. Manufacturer information is provided in **Appendix G**.

The protocol used for replacing and/or checking the conditions and tightness of belts at the Roxana SVE system is as follows:

- The power supply to the system is turned off and kill switch is left in the depressed position.
- Breakers are shut down and lock out locks applied to breaker boxes to insure power cannot be accidentally restored.
- Proper PPE is worn: safety vest, protective gloves, hardhat, and protective eyewear.

- Following the isolation of energy, the guard for the belt and pulley assembly is removed and belts examined.

If belts are to be replaced:

- The anchor bolts associated with the motor platform are loosened enabling the platform to move back and forth by turning the tension bolt.
- The old belts are removed from the pulleys and discarded.
- The new belts are placed on the correct corresponding pulleys on either end of the assembly.
- The tension bolt is turned to pull the belts to a tight position on the pulleys.
- The anchor bolts associated with the motor platform are tightened to prevent any movement of the motor.
- Tension is checked utilizing a tension gauge.
- The guard for the belt and pulley assembly is returned and secured with bolts.
- The power supply is restored by pulling out the depressed kill switch and restarting the system.

***At no time should the system be restarted or power be restored to the system or system components while any guards protecting any moving parts are not in place and secured.**

5.3.5.6 Leak Test on Natural Gas Line

Natural gas is provided to the RTO to operate the pilot light and as a supplemental fuel source, if needed. Most of the connections associated with the natural gas line are welded. However, the natural gas line connections located on the eastern side of the RTO are threaded. Previously, it was identified that the threaded connections loosened and a natural gas odor was detected in the immediate area. Each month, the threaded connections are to be tested for leakage by applying soap and water solution and observations are to be made for the presence of "bubbling". In addition, the operator is to utilize MiniRae and QRae air monitors at the threaded connections to check for leakage. URS will contract licensed pipe fitters to tighten the pipe connections if leakage is detected at the threaded connections either by use of soapy water or air monitors.

5.3.5.7 Rotation of Blower Fins

URS maintains a spare blower in the storage area of the western most connex unit. The blower was shipped to the site without oil in it. It is recommended to rotate the blower input shaft every few weeks by hand to keep from developing a flat spot on the bearing.

5.3.5.8 Pitot Tube Maintenance

Pitot tubes have been installed in each incoming vapor line and in each header line in order to obtain vacuum and differential pressure readings. The pitot tubes can become blocked with debris (rust and soil particles). The pitot tubes should be cleaned at least every three months or when blockage is suspected. Pitot tubes should be disassembled. For minor blockages can be removed by using a can of pressurized air and tygon tubing. To remove more established blockages the pitot tubes can be soaked in CLR (Calcium, Lime, Rust) solution for a period of time prior to using pressurized air. The pitot tubes should be allowed to sufficiently dry prior to reinstallation.

6.0 MONITORING AND SAMPLING

The objective of the SVE Well Performance Monitoring Program is to monitor the operation and performance of the SVE system utilizing data collected from the system extraction wells and VMPs. Scheduled extraction well monitoring will initially be conducted on a monthly basis at each of the 39 extraction wells located in the WRR and Village of Roxana and 6 Public Works extraction wells as outlined below. Additional monitoring and maintenance of approximately 63 VMP locations, each consisting of multiple ports screened at varying depths, will be performed in conjunction with monitoring the extraction wells. Sampling is sequenced to ensure extraction well and VMP well data corresponds spatially and temporally. A schedule of the SVE performance monitoring activities is presented in **Table 2**.

Monitoring and maintenance frequencies are likely to change based on the needs of the SVE system. Therefore, the procedures presented in this document shall be reviewed and updated on an ongoing basis to remain consistent with changing field conditions.

Field activities are conducted by the system operators. The scope of data collection includes:

- Vacuum, fluid level measurements, and total volatile organic compound (VOC) sampling at operational extraction wells
- Vacuum and VOC sampling at all VMPs
- Permit required exhaust sampling at RTO

Equipment used in the subsurface monitoring includes:

- Manometers for vacuum measurements
- Photo Ionization Detectors (PIDs) / Flame Ionization Detectors (FIDs) for VOC concentration
- Gas meters for O_2, CO_2, LEL, and methane gas measurements
- Manometers (digital) and pitot tubes for air flow at SVE wells and piping
- Dataloggers for digitally compiling data
- Interface probe to determine fluid levels

The Scope of the SVE Performance Monitoring Program is summarized in the text below. The following Standard Operating Procedures (SOPs) are included in the **Appendix N**:

- URS SOP No. 3 – Calibration and Maintenance of Field Instruments
- URS SOP No. 4 – Equipment Decontamination
- URS SOP No. 48 – Soil Vapor Extraction Well Data Collection and Sampling
- URS SOP No. 49 – SVE Effectiveness Monitoring at Vapor Monitoring Points
- URS SOP No. 52 – Soil Vapor Field Laboratory Screening
- URS SOP No. 53 – Dwyer Digital Manometer

6.1 EXTRACTION WELLS

6.1.1 Monitoring and Sampling

Monitoring and sampling at each extraction well location will include the activities listed below.

Water Removal from Well Vaults

Extraction well vaults will be checked for the presence of water. If water is present, a suitable portable pump will be used to dewater the well vault and pumped water will be discharged to the ground, assuming that the water is rainwater seeping in and it is free of sheen.

Vacuum Readings

Vacuum readings will be obtained at each extraction well by connecting a digital manometer to the sample port installed on the well and turning the sample port lever to the open position. Specific procedures for the collection of vacuum measurements are presented in URS SOP- 48.

Typical ranges for readings in extraction wells at optimal operating conditions are:

- Vacuum: 10-30 in WC

Fluid Level Measurement

In order to determine open screen lengths and potential silt accumulation, each extraction well will be gauged for depth to product (if present), depth to water, and total depth using a decontaminated interface meter. Specific procedures for collection of fluid level measurements are presented in **Appendix N**, URS SOP-48.

Vapor Sampling

The concentrations of the vapors present in effluent flow from each extraction well will be

measured during each event. Soil vapor samples will be collected in tedlar bags utilizing a peristaltic pump. Specific procedures for collection of vapor sample measurements are presented in **Appendix N**, URS SOP-48.

Soil vapor screening samples collected from the extraction wells will be analyzed at the Site trailer using the following equipment:

- TVA-1000 or performance equivalent for volatile organic compounds (VOCs) and methane by FID and for VOCs by PID
- LANDTEC GEM-2000 or performance equivalent for oxygen and carbon dioxide.

Specific procedures, including those for equipment calibration and quality control, are presented in **Appendix** N, URS SOP-03.

6.2 VMP WELLS

6.2.1 Monitoring and Sampling

In order to evaluate the effectiveness of the SVE system, vapor and vacuum monitoring at approximately 63 VMP well clusters will be conducted (**Figure 3**). Data collected from the VMP wells will help in evaluating the zone of influence from the SVE system and variations in hydrocarbon vapor impact. Based on this information, the SVE system vacuum and vicinity emphasis may be adjusted to optimize hydrocarbon vapor recovery. VMP monitoring and maintenance will consist of the activities described below.

Initial Vacuum/Pressure Measurement

Using a digital manometer, the initial vacuum/pressure will be measured at each VMP monitoring location. Basic manometer operation instructions can be found in **Appendix N**, URS SOP-53. The pressure, and time it was observed, is immediately read and recorded to the nearest hundredth of an inch (or tenth of an inch if using 0-200 manometer) of water column. The specific procedures for collection of initial vacuum/pressure measurements are presented in **Appendix N**, URS SOP-53.

Well Purging

After obtaining the initial vacuum/pressure measurements and prior to soil vapor sample collection, a 60 mL syringe will be used at each VMP monitoring location to purge a predetermined amount of air based on the volume of the well riser and screen. The purge

volume shall be equivalent to a minimum of three well volumes. Specific procedures for well purging are presented in **Appendix N**, URS SOP-49.

Soil Vapor Sampling

If water and/or product are encountered during sample collection, this observation will be documented. Samples which indicate the presence of water and/or product will not be analyzed.

Following purging activities, air samples for on-site screening will be collected using a Tedlar bag and a peristaltic pump. The inlet of the peristaltic pump tubing is attached to the well and the positive pressure (output) side of the peristaltic pump will be attached to the inlet side of the flow calibrator (or rotometer). The rotometer will be used to adjust the flow rate of the peristaltic pump to allow a flow rate of 200 mL/minute.

After setting the sample flow, the rotometer will be removed from the sample train and a new, clean, pre-labeled one-liter Tedlar bag will be connected to the tubing exiting from the output side of the peristaltic pump. Upon retrieval of the one-liter sample volume, close the valve on the Tedlar bag, turn off the peristaltic pump, and close the well to the atmosphere. Place the sample bag in a black trash bag or container that will minimize exposure to sunlight. Specific procedures for soil vapor sampling are presented in **Appendix N**, URS SOP-49.

Venting

Upon completion of soil vapor screening, VMP monitoring locations are vented (opened to atmosphere) for 15 minutes. This allows for well stabilization to occur.

Stabilized Vacuum/Pressure Measurement

Once the VMP has been allowed to vent for 15 minutes, a stabilized vacuum/pressure measurement will be recorded using a digital manometer. A pressure is considered to be stabilized when it does not fluctuate more than 5% in one minute. The manometer will be allowed a maximum of thirty (30) minutes to stabilize before the vacuum/pressure is recorded. Specific procedures for the collection of stabilized vacuum/pressure measurements are presented in **Appendix N**, URS SOP-49.

Soil Vapor Field Laboratory Screening

Soil vapor screening samples collected from the VMP monitoring locations will be analyzed at the field trailer using the following equipment:

- TVA-1000 or performance equivalent for VOCs and methane by FID and for VOCs by PID

- LANDTEC GEM-2000 or performance equivalent for oxygen and carbon dioxide.

Specific procedures, including those for equipment calibration and quality control, are presented in **Appendix N,** URS SOP-53.

6.3 RTO EXHAUST SAMPLING

The Illinois Environmental Protection Agency (IEPA) has issued a Joint Construction and Operating Permit (**Appendix O**) for the operation of the Roxana SVE system. The following sampling requirements are outlined under **Section 8** of the permit.

Measured exhaust/total VOM and HAP		
At Startup:	1/day for 1st 3 days	Lab Samples Collected - Analyzed by USEPA method TO-15
First 3 weeks:	2 times/week	
Normal operation (1st four months of operation):	1/month	
Normal operation (After four months of operation):	1/month	PID/FID

6.4 DAILY MONITORING

The objective of the Daily SVE Monitoring is to monitor the operation and performance of the SVE system. System information is generally collected each working day. Data collected includes: ambient air temperature and barometric pressure; RTO cold face, chamber and stack temperatures; RTO hot gas bypass valve position; dilution valve positions; header and exhaust vacuum and differential pressure readings; incoming vapor line and supplemental dilution valve vacuum, differential pressure, and temperature readings; fluid level measurements associated with tanks and vapor liquid separators; integrity of secondary containment systems; natural gas usage, and hours of operation. Several of the data parameters are utilized to calculate flow of the individual vapor lines and headers and flow of the RTO exhaust. In addition, the data can be utilized to determine when system modifications are made and when system maintenance is to be performed.

7.0 REPORTING

7.1 OPERATIONAL STATUS REPORTS

All data collected during the O&M operations including all system readings, vacuum and flow measurements as well as vapor monitoring sampling events will continue to be reported following each quarterly sampling event.

7.2 PERMIT REQUIRED REPORTING and LIMITS

The Illinois Environmental Protection Agency (IEPA) has issued a Joint Construction and Operating Permit (**Appendix O**) for the operation of the Roxana SVE system. The following key items are outlined under the permit.

<table>
<tr><th>Permit Section</th><th>Requirement</th></tr>
<tr><td>1.b</td><td>Expiration: The current FESOP expired January 14, 2013. However, a renewal application was submitted to the IEPA in a timely basis, the previously-issued Joint Construction and Operating Permit remains in place until a new permit is issued by the IEPA.</td></tr>
<tr><td>3.c</td><td>Total maximum firing rate: 1.4 mmBtu/hour
<table>
<tr><th rowspan="2">Pollutant</th><th>Emission Factor</th><th colspan="2">Emissions</th></tr>
<tr><th>Lbs/mmBtu</th><th>Tons/Mo</th><th>Tons/Yr</th></tr>
<tr><td>CO</td><td>0.00745</td><td>0.01</td><td>0.05</td></tr>
<tr><td>NO_X</td><td>0.10</td><td>0.07</td><td>0.62</td></tr>
<tr><td>PM</td><td>0.0824</td><td>0.06</td><td>0.51</td></tr>
<tr><td>SO_2</td><td>0.60</td><td>0.37</td><td>3.70</td></tr>
</table></td></tr>
<tr><td>3.d</td><td>Compliance Determination: Must be kept monthly (sum of the data for the current month plus the preceding 11 months)</td></tr>
<tr><td>6</td><td>If operations result in an odor nuisance, controls and/or changes in raw materials must be implemented.</td></tr>
<tr><td>7.a</td><td>Perform periodic inspections and maintenance on the equipment covered under the permit. (Periodic is not defined in the permit). (Standard permit condition 8, for all state operating permits, also requires a maintenance record for each piece of control equipment and at a minimum is required to show the dates of performance and nature of preventative maintenance activities.)</td></tr>
</table>

<table>
<tr><td>8.a</td><td>
<table>
<tr><th colspan="3">Measured exhaust/total VOM and HAP</th></tr>
<tr><td>At Startup:</td><td>1/day for 1st 3 days</td><td rowspan="3">Lab Samples Collected - Analyzed by USEPA method TO-15</td></tr>
<tr><td>First 3 weeks:</td><td>2 times/week</td></tr>
<tr><td>Normal operation (1st four months of operation):</td><td>1/month</td></tr>
<tr><td>Normal operation (After four months of operation):</td><td>1/month</td><td>PID/FID</td></tr>
</table>
</td></tr>
<tr><td>8.b</td><td>
<table>
<tr><th colspan="2">Measured exhaust Air Flow Rate (dscfm)</th></tr>
<tr><td>At Startup:</td><td>1/day for 1st 3 days</td></tr>
<tr><td>First 3 weeks:</td><td>2 times/week</td></tr>
<tr><td>Normal operation (Following 1st 4 weeks of operation):</td><td>1/month</td></tr>
</table>
</td></tr>
<tr><td>8.c</td><td>
<table>
<tr><th colspan="2">Hours of System Operation</th></tr>
<tr><td>Hours/month</td><td>Hours/year</td></tr>
</table>
</td></tr>
<tr><td>8.d</td><td>
<table>
<tr><th colspan="2">Propane/Natural Gas Usage</th></tr>
<tr><td>mmscf/month</td><td>mmscf/year</td></tr>
</table>
</td></tr>
<tr><td>8.e</td><td>
<table>
<tr><th colspan="2">VOM and HAP (single & combined) Emissions*</th></tr>
<tr><th>tons/month</th><th>tons/year</th></tr>
<tr><td colspan="2">*Based on equation in Condition 3 and data collected in permit conditions 8.a.-c and SO_2, NO_X, PM, and CO RTO combustion emissions from Permit Condition 3.c.</td></tr>
</table>
</td></tr>
<tr><td>9</td><td>Records/logs retentions: Kept for at least 5 years.</td></tr>
<tr><td>Standard</td><td>Requires a maintenance record for each piece of control equipment and at a minimum is</td></tr>
</table>

Cond. 8	required to show the dates of performance and nature of preventative maintenance activities.
Standard Cond. 10	Annual Emissions Report
Standard Cond. 11	Annual Site Fee

7.3 EQUIPMENT FAILURE NOTIFICATION

In the event of an equipment failure directly causing a deviation from conditions of the operating permit, URS will discontinue operation of the affected unit(s) until repairs are made. URS will also notify the Illinois EPA of the deviations as required. The report will include a description of the deviation, the probable cause of such a deviation, and any corrective measures taken to correct the deviation.

Tables

Table 1
SVE Well Construction

Well ID	Screen Top (ft bgs)	Screen Bottom (ft bgs)
SVE-3R	31	41
SVE-4	5	15
SVE-5	10	20
SVE-6	10	20
SVE-7	10	20
SVE-8	9	19
SVE-9	10	20
SVE-10	10	20
SVE-11	10	20
SVE-12	10	20
SVE-13	10	20
SVE-14	10	20
SVE-15	10	20
SVE-16	10	20
SVE-17	10	20
SVE-18	8	18
SVE-19	11	21
SVE-20	25	35
SVE-21	25	35
SVE-22	25	35
SVE-23	15	25
SVE-24	15	25
SVE-25	10	25
SVE-26	20	30
SVE-27	20	30
SVE-28	41	51
SVE-29	20	30
SVE-30	25	35
SVE-31	25	35
SVE-32	25	35
SVE-33	25	35
SVE-34	25	45
SVE-35	31	41
SVE-36	10	20
SVE-37	25	35
SVE-38	25	35
SVE-39	25	35
SVE-40	25	35
SVE-41	20	30
SVE-42	25	35
SVE-43	25	35
SVE-44	25	35
SVE-45	37	42
SVE-46	15	25
SVE-47	15	25

bgs - below ground surface

TABLE 1B
VMP Well Construction

	Yellow 1st Interval	White 10 foot Depth	Blue 2nd Interval	Green 3rd Interval	Red 4th Interval	Notes:
VMP-1	5		8.5	23.5	38.5	Village of Roxana - 1st Street
VMP-2	5		8.5	22	42	Village of Roxana - Alley Between 3rd and 4th Street
VMP-3	5	10	22	31.5	39	Village of Roxana - Alley Between 2nd and 3rd Street
VMP-4	5		12	23.5	39	Village of Roxana - Alley Between 4th and 5th Street
VMP-5	5		12.5	31	40	Village of Roxana - Alley Between 5th and 6th Street
VMP-6	5		10	31.5	39	Village of Roxana - Alley Between 6th and 7th Street
VMP-7	5		13.5	29.5	38	Village of Roxana - 7th Street
VMP-8	5		9.5	23.5	35.5	Village of Roxana - Alley Between 7th and 8th Street
VMP-9	5		11.5	25.5	38.5	Village of Roxana - Alley Between 7th and 8th Street
VMP-10	5		10	20	30	Public Works Yard
VMP-11	5		8	29	38	Public Works Yard
VMP-12	5		11.5	25	39	WRR- North Property
VMP-13	5		10.5	21.5	29.5	Public Works Yard
VMP-14	5		11.5	20	29	Public Works Yard
VMP-15	5		21.5	25.5	29	Village of Roxana - SE of Route 111 and Rand Avenue
VMP-16	5		13.5	19	31	WRR- Main Property
VMP-17	5					Public Works Yard
VMP-18	8.5					Village of Roxana - 8th Street
VMP-19	5					Village of Roxana - 8th Street
VMP-20	5		10	25	39.5	Village of Roxana - Alley Between 2nd and 3rd Street
VMP-21	5		10	25	33	Village of Roxana - Alley Between 3rd and 4th Street
VMP-22	5		10	18	38	Village of Roxana - Alley Between 4th and 5th Street
VMP-23	5		10	25	40	Village of Roxana - Alley Between 5th and 6th Street
VMP-24	5		10	22	34	Village of Roxana - 7th Street
VMP-25	5		9.5	21	31	Village of Roxana - Corner of Rand Avenue and Route 111
VMP-26	10		20	30	40	WRR - North Property
VMP-27	10		20	30	40	WRR - North Property
VMP-28	10		20	30	40	WRR - North Property
VMP-29	10		20	30	40	Public Works Yard
VMP-30	10		20	30	40	Public Works Yard
VMP-31	5		10	20	30	Village of Roxana - Chaffer Street (Abandoned in June 2014)
VMP-32	5		10	20	30	Village of Roxana - 4th Street
VMP-33			10	20	30	WRR - North Property
VMP-34			10	20	30	WRR - North Property
VMP-35			10	20	30	WRR - North Property
VMP-36			10	20	30	WRR - North Property
VMP-37			10	20	30	WRR - North Property
VMP-38			10	20	30	WRR - North Property
VMP-39			10	20	30	WRR - North Property
VMP-40			10	20	30	WRR - North Property
VMP-41			10	20	30	Public Works Yard
VMP-42			10	20	30	Village of Roxana - Corner of Chaffer Street and 3rd Street
VMP-43			10	20	30	Village of Roxana - Corner of Chaffer Street and 4th Street
VMP-44			10	20	30	Village of Roxana - Corner of Chaffer Street and 5th Street
VMP-45			10	20	30	Village of Roxana - Corner of Chaffer Street and 6th Street
VMP-46			10	20	30	WRR - North Property
VMP-47	5		10	20	30	Village of Roxana - Corner of Chaffer Street and Alley Between 1st and 2nd Street
VMP-48	5		10	20	30	Village of Roxana - Alley Between 2nd and 3rd Street
VMP-49	5		10	20	30	Village of Roxana - Alley Between 3rd and 4th Street
VMP-50	5		10	20	30	Village of Roxana - Alley Between 4th and 5th Street
VMP-51	5		10	20	30	Village of Roxana - Alley Between 5th and 6th Street
VMP-52	5		10	20	30	Village of Roxana - Alley Between 6th and 7th Street
VMP-53	5		10	20	30	Village of Roxana - Alley Between 7th and 8th Street
VMP-54	5		10	20	30	Village of Roxana - Alley Between 7th and 8th Street
VMP-55	5		10	20	30	Public Works Yard Area; Route 111 Right-of-Way
VMP-56			10	25	38.5	Village of Roxana - Corner of Chaffer Street and 4th Street
VMP-57	5		10	20	30	WRR - North Property
VMP-58	5		10	20	30	WRR - North Property
VMP-59	5		10	20	30	WRR - North Property
VMP-60	5		10	20	30	WRR - North Property
VMP-61	5		10	20	30	WRR - North Property
VMP-62	5		10	20	30	Village of Roxana - Alley Between 1st and 2nd Street
VMP-63	5		10	20	30	Village of Roxana - Corner of Chaffer Street and 1st Street
VMP-64	5		10	20	28	Village of Roxana - Corner of Chaffer Street and Alley Between 1st and Tydeman

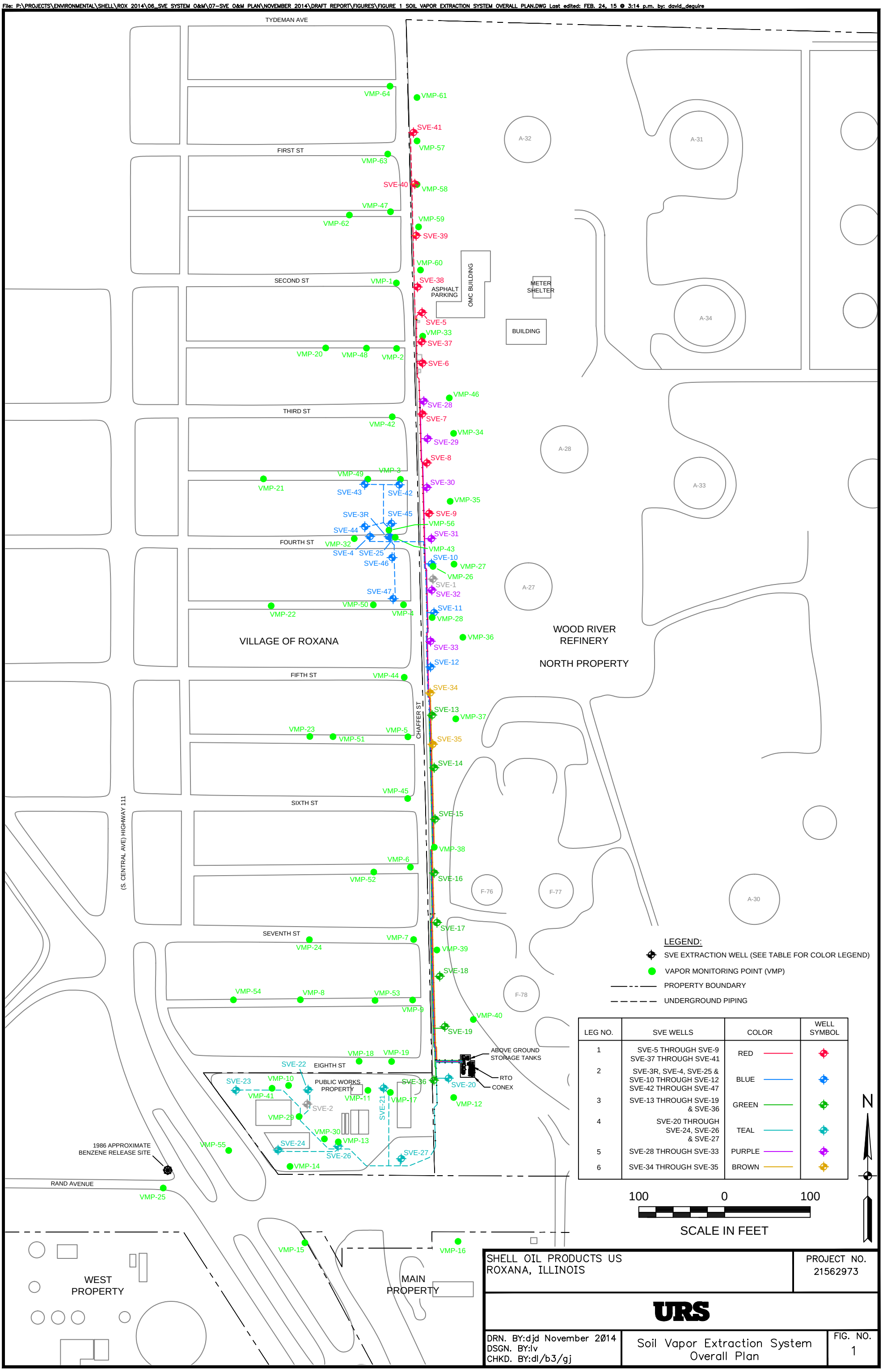
Table 2
SVE Performance Monitoring Schedule

	Activity	Frequency			Equipment	SOP
		SVE System Commissioning	Commissioning Completion to 3 months	> 3 months		
SVE Wells (41)	Soil Vapor Screening	Commissioning	Monthly	Monthly	Tedlar bag Vacuum chamber Vacuum pump	Roxana SOP-49
	Vacuum/Pressure Measurement				Digital manometer	Roxana SOP-49
	Fluid Level Measurement				Interface meter	Roxana SOP-49
WRR VMP Wells (18)	Initial Vacuum/Pressure Measurement	Commissioning	Monthly	Monthly	Digital manometer	Roxana SOP-49
	Well Purging				60 mL syringe	Roxana SOP-49
	Soil Vapor Screening				Tedlar bag Peristaltic pump	Roxana SOP-49
	Venting				None	NA
	Stabilized Vacuum Pressure Measurement				Digital manometer	Roxana SOP-49
	Soil Vapor Field Laboratory Screening				TVA-1000 (PID/FID) ppbRAE (PID) Landtec Gem 2000 (O2, CO2)	Roxana SOP-52
Village VMP Wells (36)	Initial Vacuum/Pressure Measurement	Commissioning	Monthly	Monthly	Digital manometer	Roxana SOP-49
	Well Purging				60 mL syringe	Roxana SOP-49
	Soil Vapor Screening				Tedlar bag Peristaltic pump	Roxana SOP-49
	Venting				None	NA
	Stabilized Vacuum Pressure Measurement				Digital manometer	Roxana SOP-49
	Soil Vapor Field Laboratory Screening				TVA-1000 (PID/FID) ppbRAE (PID) Landtec Gem 2000 (O2, CO2)	Roxana SOP-52

	Activity	Frequency			Equipment	SOP
		SVE System Commissioning	Commissioning Completion to 4 months	> 4 months		
RTO Exhaust	Exhaust Sampling	1/day for first 3 days 2/week for first 3 weeks	Monthly	Monthly	1-L Summa Canister	USEPA TO-15
		NA	NA	Monthly	Tedlar bag Peristaltic Pump	Roxana SOP-49
	Soil Vapor Field Laboratory Screening	NA	NA	Monthly	TVA-1000 (PID/FID) ppbRAE (PID) Landtec Gem 2000 (O2, CO2)	Roxana SOP-52

Figures

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014\06_SVE SYSTEM O&M\07-SVE O&M PLAN\NOVEMBER 2014\DRAFT REPORT\FIGURES\FIGURE 1 SOIL VAPOR EXTRACTION SYSTEM OVERALL PLAN.DWG Last edited: FEB. 24, 15 @ 3:14 p.m. by: david_deguire



SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

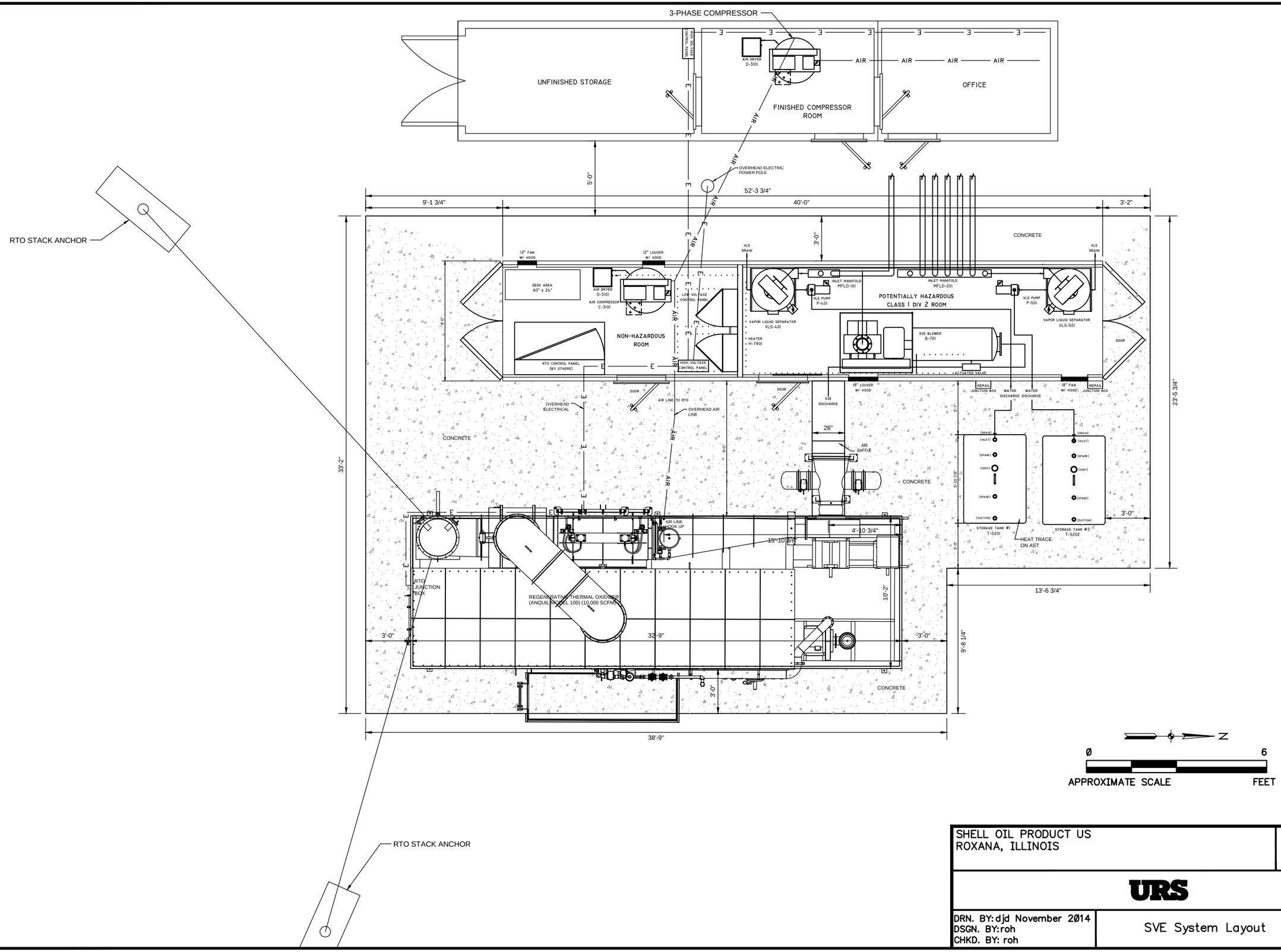
PROJECT NO. 21562973

URS

DRN. BY:djd November 2014
DSGN. BY:lv
CHKD. BY:dl/b3/gj

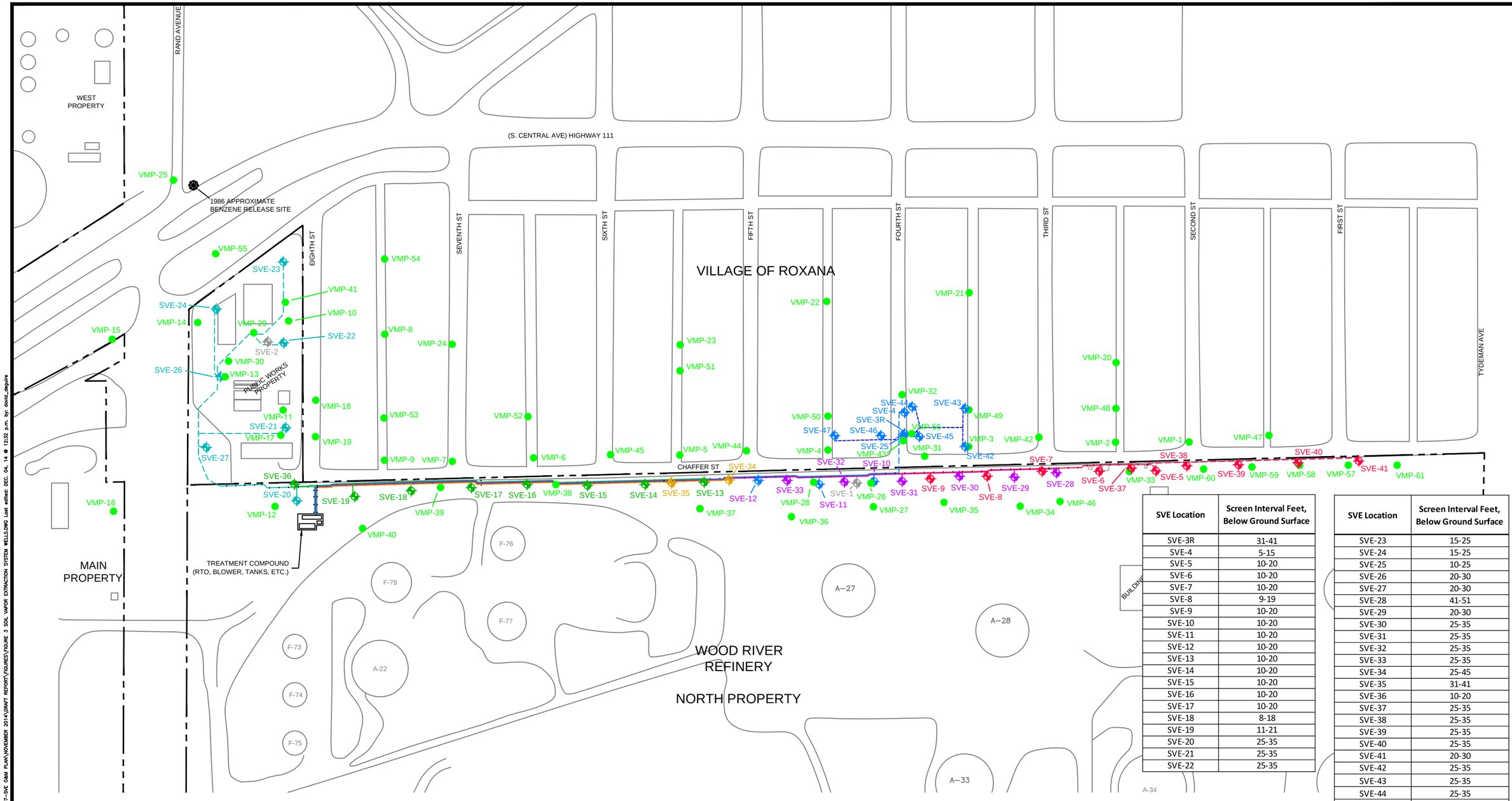
Soil Vapor Extraction System Overall Plan

FIG. NO. 1



SHELL OIL PRODUCT US ROXANA, ILLINOIS	PROJECT NO. 21562793
URS	
DRN. BY: djd November 2014 DSGN. BY: roh CHKD. BY: roh	SVE System Layout — FIG. NO. 2

File: P:\PROJECTS\ENVIRONMENTAL\SHELL OIL PRODUCTS US 2014\3-ROXANA\06_SVE SYSTEM O&M\07-SVE O&M PLAN\NOVEMBER 2014\DRAFT REPORT\FIGURES\FIGURE 2 SYSTEM LAYOUT.DWG Last edited: 11/21/14 @ 10:48 a.m. by: david_deguire



SVE Location	Screen Interval Feet, Below Ground Surface
SVE-3R	31-41
SVE-4	5-15
SVE-5	10-20
SVE-6	10-20
SVE-7	10-20
SVE-8	9-19
SVE-9	10-20
SVE-10	10-20
SVE-11	10-20
SVE-12	10-20
SVE-13	10-20
SVE-14	10-20
SVE-15	10-20
SVE-16	10-20
SVE-17	10-20
SVE-18	8-18
SVE-19	11-21
SVE-20	25-35
SVE-21	25-35
SVE-22	25-35

SVE Location	Screen Interval Feet, Below Ground Surface
SVE-23	15-25
SVE-24	15-25
SVE-25	10-25
SVE-26	20-30
SVE-27	20-30
SVE-28	41-51
SVE-29	20-30
SVE-30	25-35
SVE-31	25-35
SVE-32	25-35
SVE-33	25-35
SVE-34	25-45
SVE-35	31-41
SVE-36	10-20
SVE-37	25-35
SVE-38	25-35
SVE-39	25-35
SVE-40	25-35
SVE-41	20-30
SVE-42	25-35
SVE-43	25-35
SVE-44	25-35
SVE-45	37-42
SVE-46	15-25
SVE-47	15-25

LEG NO.	SVE WELLS	COLOR	WELL SYMBOL
1	SVE-5 THROUGH SVE-9 SVE-37 THROUGH SVE-41	RED	
2	SVE-3, SVE-4, SVE-25 & SVE-10 THROUGH SVE-12 SVE-42 THROUGH SVE-47	BLUE	
3	SVE-13 THROUGH SVE-19 & SVE-36	GREEN	
4	SVE-20 THROUGH SVE-27	TEAL	
5	SVE-28 THROUGH SVE-33	PURPLE	
6	SVE-34 THROUGH SVE-35	BROWN	

LEGEND:

- SVE EXTRACTION WELL (SEE TABLE FOR COLOR LEGEND)
- VAPOR MONITORING POINT (VMP)
- PROPERTY BOUNDARY
- UNDERGROUND PIPING

Ø 200

SCALE FEET

SHELL OIL PRODUCTS US
ROXANA, ILLINOIS

PROJECT NO. 21562973

URS

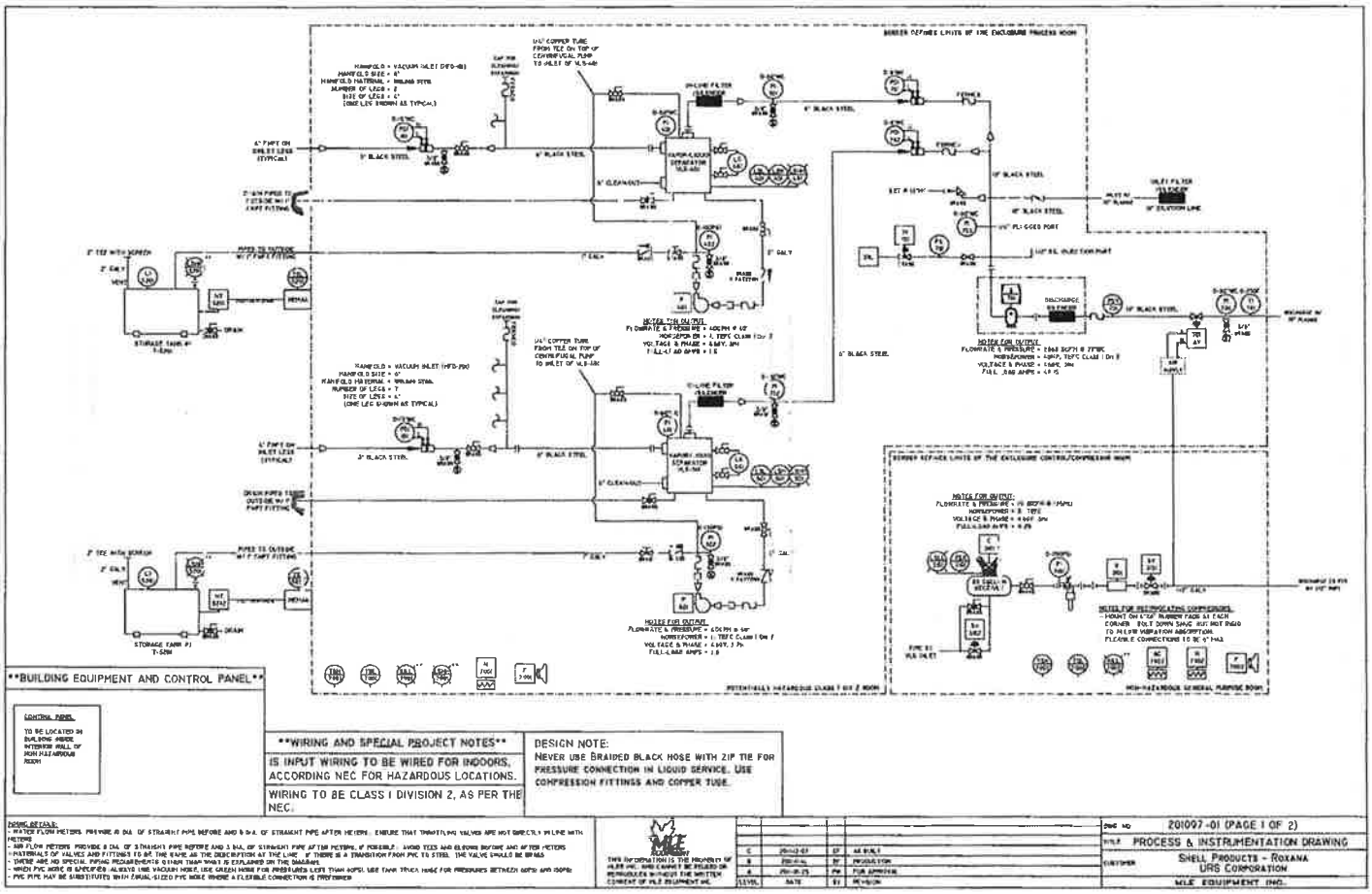
DRN. BY: djd November 2014
DSGN. BY: djd
CHKD. BY: gj

Soil Vapor Extraction System

FIG. NO. 3

File: P:\PROJECTS\ENVIRONMENTAL\SHELL\ROX 2014 OU5_SVE SYSTEM O&M\07-SVE O&M PLAN\NOVEMBER 2014\DRAFT REPORT\FIGURES\FIGURE 3 SOIL VAPOR EXTRACTION SYSTEM WELLS.DWG Last edited: DEC. 04, 14 @ 12:32 p.m. by: david_dejuire

APPENDIX A Maple Leaf SVE System As-built Drawings



URS noted in the field that the bottom drains on the VLSs have been plugged to prevent accidental drainage. GDJ 5/9/13

VALVES AND PIPING

NO NC

- BALL VALVE -
- GATE VALVE -
- GLOBE VALVE -
- NEEDLE VALVE -
- SLIDE VALVE -
- SOLENOID VALVE -
- BUTTERFLY VALVE -
- SWING CHECK VALVE -
- WAFER CHECK VALVE -
- SPRING CHECK VALVE -
- WYE STRAINER -
- SAMPLE PORT -
- PRESSURE RELIEF VALVE -
- VACUUM RELIEF VALVE -
- CAMLOCK CONNECTION -
- FLEXIBLE COUPLING - FLEX
- FLEXIBLE CONNECTION -
- FLANGED CONNECTION -
- REDUCER -
- UNION -
- ADSORBENT FILTER - ADSORB
- COALESCING FILTER - COALSR
- PARTICULATE FILTER - DEPUR
- FILTER, SILENCER -
- PRESSURE REGULATOR -
- REGULATOR W/ FILTER -
- BARBED TRANSITION FITTING -

EQUIPMENT

- AIR STRIPPER
- OIL/WATER SEPARATOR
- VAPOR/LIQUID SEAL RING SEPARATOR
- BAG FILTER
- CARBON VESSEL
- PRODUCT STORAGE DRUM, TANK
- BLOWER
- CHEMICAL DRUM
- STANDARD CONICAL BOTTOM TANK
- VIBRATION ISOLATOR

EQUIPMENT

- CENTRIFUGAL PUMP -
- PROGRESSIVE-CAVITY PUMP -
- CHEMICAL-INJECTION PUMP -
- CENTRIFUGAL REGENERATIVE BLOWER - 2
- POSITIVE-DISPLACEMENT BLOWER -
- ROTARY-CLAW BLOWER -
- LIQUID RING PUMP -
- ROTARY-VANE COMPRESSOR -
- RECIPROCATING COMPRESSOR -
- HEAT EXCHANGER - HEX
- PASSIVE COOLING FINS -

EQUIPMENT

AS - AIR ST STRIPPER
BLD - BUILDING, TRAILER OR SKID
FLT - FILTER VESSEL
LPC - LIQUID-PHASE CARBON VESSEL
MFD - MANIFOLD
OWS - OIL/WATER SEPARATOR
SB - SPARGER
PST - PRODUCT STORAGE TANK
SOS - SEAL OIL SEPARATOR
SWS - SEAL WATER SEPARATOR
TNK - TANK
VLS - VAPOR/LIQUID SEPARATOR
VPC - VAPOR-PHASE CARBON VESSEL

FLOW MEASUREMENT

- AVERAGING PITOT TUBE - RANGE FIQ R2
- VENTURI - RANGE FIQ R2
- ROTAMETER - RANGE FIQ R2
- WATER FLOW METER - FIQ R2

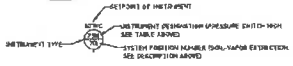
INSTRUMENT DESIGNATION

	INPUT	1ST MODIFIER	2ND MODIFIER	3RD MODIFIER	OUTPUT	1ST MODIFIER	
A			ALARM				A
B						BLOWER	B
C	CYCLE					COMPRESSOR	C
D		DIFFERENTIAL				AIR DRYER	D
E							E
F	FLOW					FAN	F
G	GAS (LEL)		GAUGE				G
H				HIGH	HAND	HEATER	H
I	CURRENT		INDICATOR				I
J							J
K							K
L	LEVEL			LOW			L
M					MOTORIZED		M
N							N
O							O
P	PRESSURE				PNEUMATIC	PUMP	P
Q							Q
R		QUANTITY					R
S	SPEED		SWITCH		SOLENOID		S
T	TEMPERATURE		TRANSMITTER				T
U							U
V						VALVE	V
W							W
X							X
Y							Y
Z	POSITION						Z

INSTRUMENT IDENTIFICATION

- INDICATING INSTRUMENT
- DIGITAL INPUT TO CONTROL PANEL
- DIGITAL INPUT CAUSING ALARM
- DIGITAL INPUT CAUSING SYSTEM SHUTDOWN ALARM
- ANALOG INPUT TO CONTROL PANEL
- ANALOG OUTPUT FROM CONTROL PANEL

EXAMPLE



SYSTEM POSITION DESIGNATION

100 - VACUUM INLET MANIFOLD
300 - INLET HEAT EXCHANGER
400 - VAPOR/LIQUID SEPARATOR
500 - VAPOR/LIQUID SEPARATOR - 2
700 - SOIL-VAPOR EXTRACTION
1000 - LIQUID-RING PUMP
1300 - SVE HEAT EXCHANGER
1600 - VAPOR-PHASE CARBON
1900 - OXIDIZER
2200 - AIR SPARGE
2500 - SPARGE HEAT EXCHANGER
2800 - SPARGE OUTLET MANIFOLD
3100 - AIR COMPRESSOR
3400 - COMPRESSED-AIR OUTLET MANIFOLD
3700 - PNEUMATIC WELL PUMPS
4000 - SUBMERSIBLE WELL PUMPS
4300 - SURFACE-MOUNT WELL PUMPS
4600 - GROUNDWATER INLET MANIFOLD
4900 - OIL/WATER SEPARATOR
5200 - PRODUCT STORAGE TANK
5500 - INLET TANK
5800 - UPSTREAM BAG FILTER
6100 - CHEMICAL INJECTION
6400 - AIR STRIPPER
6700 - PRE-CARBON BAG FILTER
7000 - LIQUID-PHASE CARBON
7300 - PRE-MEDIA BAG FILTER
7600 - ACTIVATED ALUMINA
7900 - DISCHARGE TANK
8200 - POST-TREATMENT BAG FILTER
8500 - REINJECTION
8800 - BUILDING/TRAILER DESIGN
9100 - CONTROL PANEL
9400 - ELECTRICAL PANELS
9700 - EXTRAS

LEVEL	DATE	BY	REVISION
C	08/12/03	BY	AS BUILT
B	05/15/03	BY	PRODUCTION
A	03/10/03	PM	FOR APPROVAL

DWG NO 201097-01 (PAGE 2 OF 2)
TITLE P&ID LEGEND
CUSTOMER SHELL PRODUCTS - ROXANA LMS CORPORATION
MLE EQUIPMENT INC.

CONTACTORS

COIL FOR LARGE MOTOR — M7 — A1 / A2

COIL FOR SMALL MOTOR — M7 — L3 — A2 / A1

DISPLAYS

PANEL HOUR METER — HR101

PANEL AMMETER — AMP101

PANEL RUN LIGHT — LT101 — X1 / G / X2 — LOCATED ON PANEL DOOR

PANEL ALARM LIGHT — LT101,2 — X1 / R / X2 — LOCATED ON PANEL DOOR

PANEL AMBER LIGHT — LT101,1 — X1 / A / X2 — LOCATED ON PANEL DOOR

POWER SUPPLY

PS101

24VDC POWER SUPPLY — L1 — N — GND — +24V — 0VDC

SWITCHES

LEVEL SWITCH NO

LEVEL SWITCH NC

PRESSURE SWITCH NO

PRESSURE SWITCH NC

FLOW SWITCH NO

FLOW SWITCH NC

TEMPERATURE SWITCH NO

TEMPERATURE SWITCH NC

NORMALLY OPEN CONTACT

NORMALLY CLOSED CONTACT

RELAYS

RELAY COIL — CR101 — 13 / T4

RELAY TABLE

PIN SUPP	+13/14
9,5/9,1	
10,6/10,2	
11,7/11,3	213
12,8	12,4

LOCATION OF CONTACT

GENERAL PURPOSE AREA

CLASS 1 DIV 2 AREA

MOTORS

3 ph MOTOR — MTR101,2 — T1 / T2 / T3 — M — 1 HP, 1 GAUGE, 1 AMP, 1 MOTOR

1 ph MOTOR — MTR101 — T1 / T2 — M — 1 HP, 1 GAUGE, 1 AMP, 1 MOTOR

IS BARRIERS

4CH IS BARRIER DIP SETTINGS

INPUT - OUTPUT OPERATIONS	SW1 CH.1	SW1 CH.2	SW1 CH.3	SW1 CH.4
IN NO - OUT NO / IN NC - OUT NC	OFF	OFF	OFF	OFF
IN NO - OUT NC / IN NC - OUT NO	ON	ON	ON	ON
LINE FAULT DETECTION	SW1 CH.1	SW1 CH.2	SW1 CH.3	SW1 CH.4
DISABLED	OFF	OFF	OFF	OFF
ENABLED	ON	ON	ON	ON

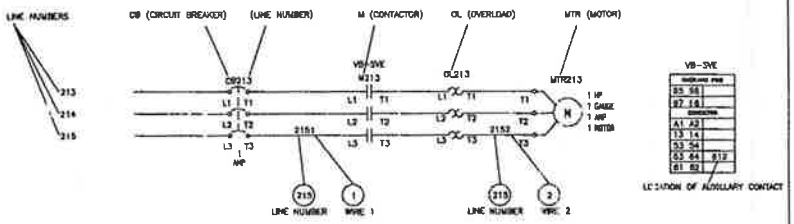
FACTORY DEFAULT DIP SETTINGS

ON		ON		ON		ON
OFF	OFF		OFF		OFF	
1	2	3	4	5	6	7	8

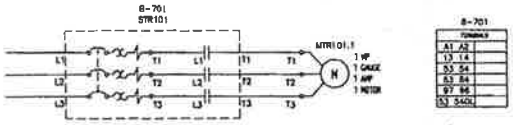
IS101 — IN 1 (13, 14, 3, 4) — IN 2 (15, 16, 1, 2) — IN 3 (9, 10, 5, 6) — IN 4 (11, 12, 7, 8) — 0103IO — 4 CHANNEL ISBARRIER

IS101,1 — IN 1 (13, 14, 3, 4) — IN 2 (15, 16, 1, 2) — 0101IO — 2 CHANNEL ANALOG ISBARRIER

WIRE NUMBER DESCRIPTION



COMBINATION MOTOR STARTER



WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

1. ENCLOSURE TO BE NOT US CERTIFIED, BUILT TO CLASS 1, DIV 1 STANDARDS. ALL WIRING INTRINSICALLY SAFE AND ALL EQUIPMENT PRE-WIRED AND FACTORY TESTED AND MOUNTED IN ENCLOSURE. COMPRESSOR ROOM TO BE NOT US CERTIFIED, BUILT TO SCHEDULE PURPOSE STANDARDS. ALL WIRING COMPLETE AND ALL EQUIPMENT PRE-WIRED FACTORY TESTED AND MOUNTED IN ENCLOSURE.

REV	DATE	BY	DESCRIPTION
C	12/12/11	WRITTEN	AS BUILT
B2	12/08/11	WRITTEN	PAN-701
B	11/11/11	WRITTEN	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

MCE EQUIPMENT

1325 CALIFORNIA AVE.
BROCKVILLE, ONTARIO
CANADA
K6V 5Y6
WWW.MCEQUIPMENT.COM

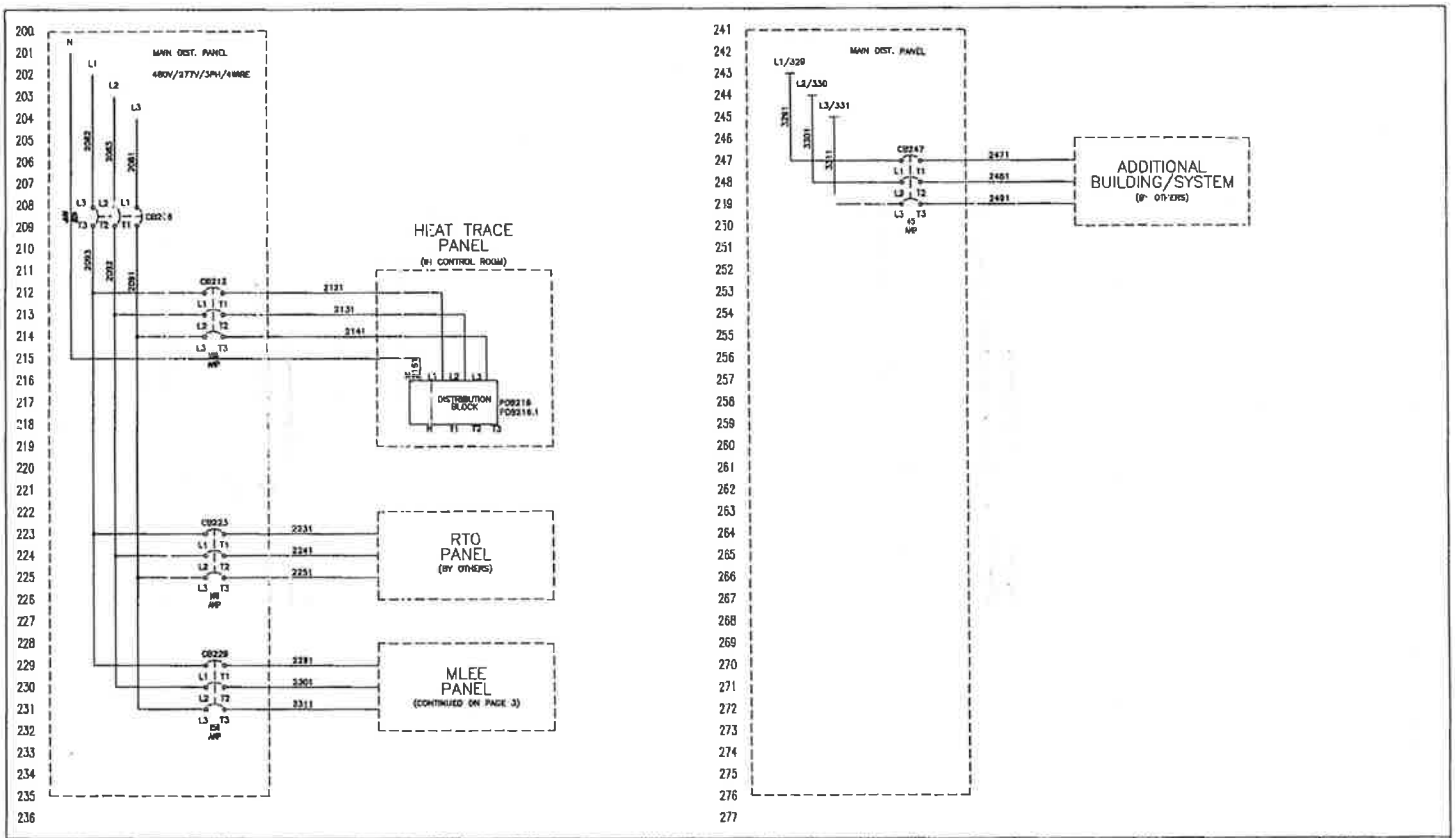
PROJECT: 201097 Shell Products - Roxana

DRAWING NO:

JOB NO: 201097

PAGE DESCRIPTION: LEGEND

PAGE: 1 OF 13



WIRE LEGEND

BLACK:	POWER
RED:	CONTROL
WHITE:	NEUTRAL
BLUE:	+24VDC & I.S.(Intrinsically Safe)
BR./WH:	0VDC
YELLOW:	INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/12/11	[illegible]	AS BUILT
B2	12/08/11	[illegible]	FAT-TST
B	11/11/11	[illegible]	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

MLEE EQUIPMENT

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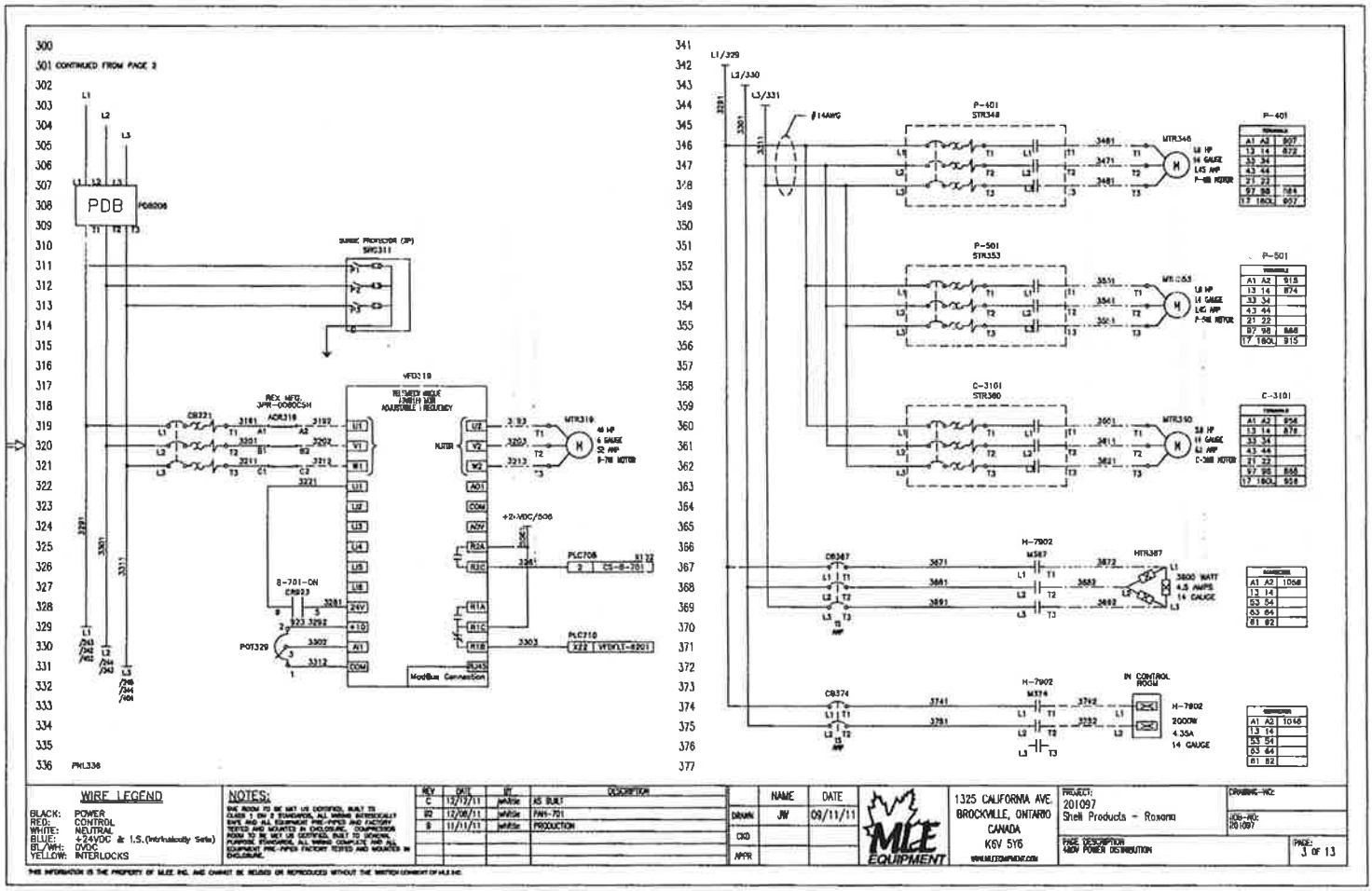
PROJECT: 201097
Shell Products – Roxana

DRAWING NO:

JOB NO: 201097

PAGE DESCRIPTION: 480V POWER DISTRIBUTION

PAGE: 2 OF 13



WIRE LEGEND	
BLACK:	POWER
RED:	CONTROL
WHITE:	NEUTRAL
BLUE:	+24VDC & I.S.(Intrinsically Safe)
BL/WH:	0VDC
YELLOW:	INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/12/11	MARSH	AS BUILT
B	12/08/11	MARSH	PAN-701
B	11/11/11	MARSH	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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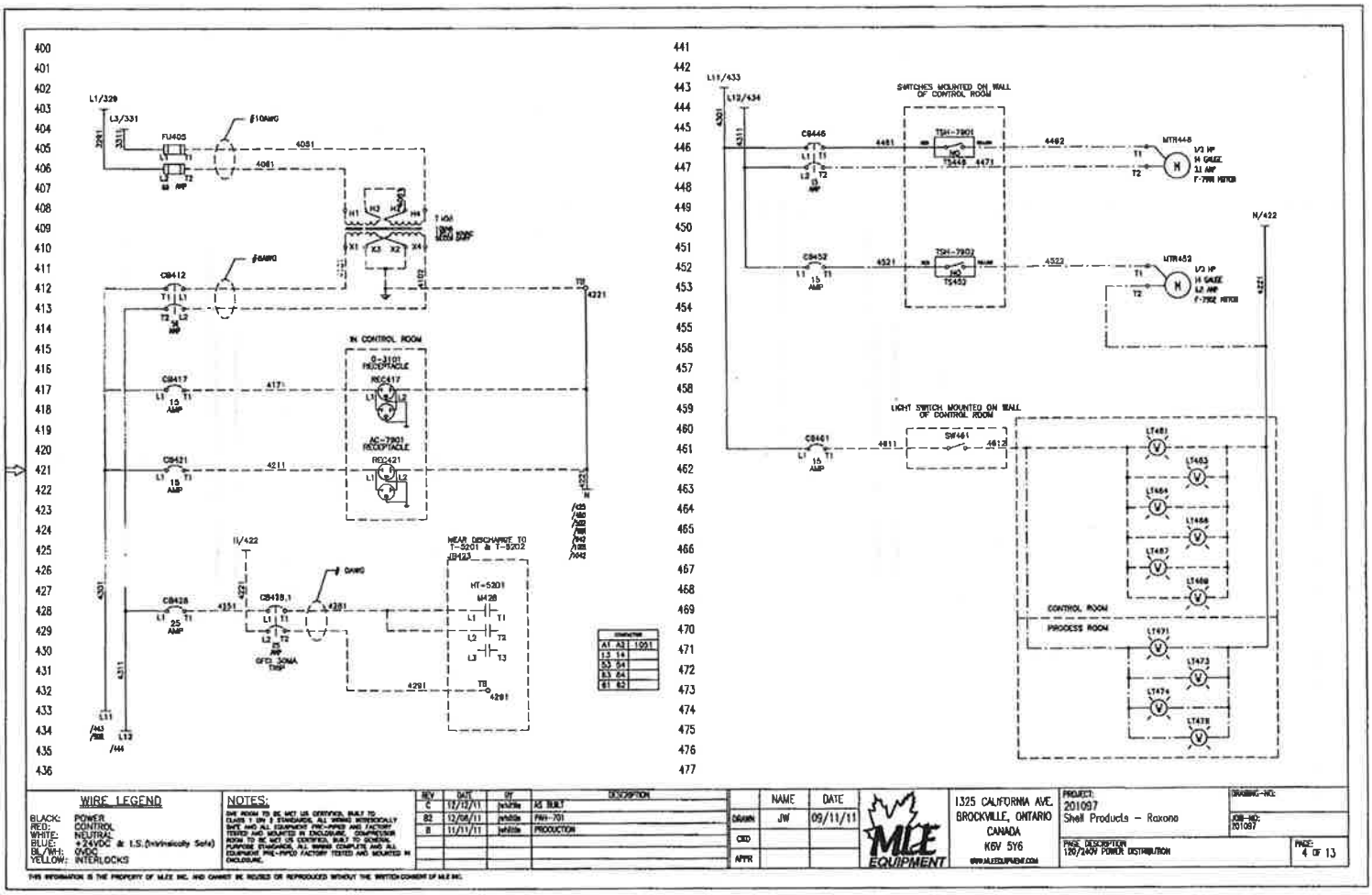
PROJECT: 201097
Shell Products - Rosario

DRAWING-WO:
JOB-WO: 201097

PAGE DESCRIPTION: 480V POWER DISTRIBUTION

PAGE: 3 OF 13



WIRE LEGEND	
BLACK:	POWER
RED:	CONTROL
WHITE:	NEUTRAL
BLUE:	+24VDC & I.S.(Intrinsically Safe)
BL/WH:	GVDCS
YELLOW:	INTERLOCKS

NOTES:

ONE ROOM TO BE MCE US CERTIFIED, BUILT TO CLASS 1, DIV 2 STANDARDS. ALL WIRING INTRINSICALLY SAFE AND ALL EQUIPMENT PRE-WIRED AND FACTORY TESTED AND MOUNTED IN ENCLOSURE. CONNECTION ROOM TO BE MCE US CERTIFIED, BUILT TO GENERAL PURPOSE STANDARDS. ALL WIRING COMPLETE AND ALL EQUIPMENT PRE-WIRED FACTORY TESTED AND MOUNTED IN ENCLOSURE.

REV	DATE	BY	DESCRIPTION
C	12/12/11	MMills	AS BUILT
B2	12/08/11	MMills	FAH-701
B	11/11/11	MMills	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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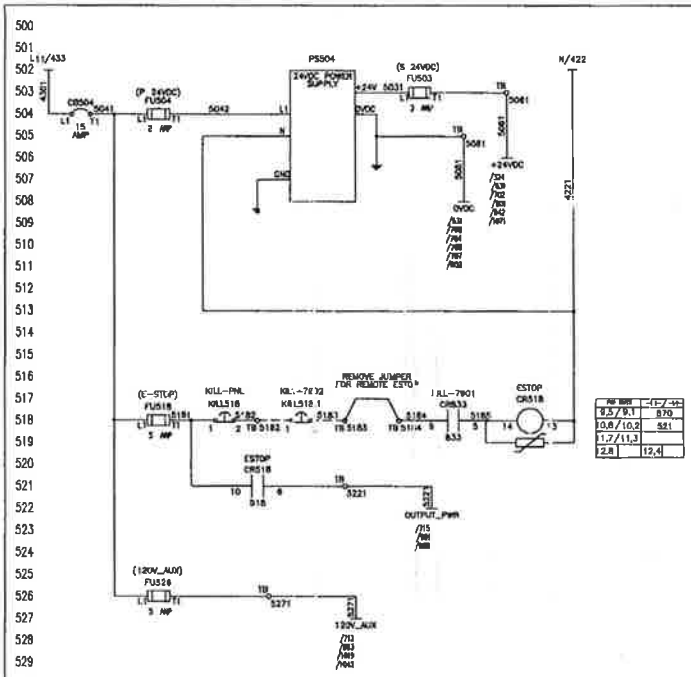
PROJECT: 201097 Shell Products – Raxone

DRAWING NO:

JOB NO: 201097

PAGE DESCRIPTION: 120/240V POWER DISTRIBUTION

PAGE: 4 OF 13



8.5 / 9.1	870
10.8 / 10.2	521
11.7 / 11.3	
2.8	12.4

WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S. (Intrinsically Safe)
GL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/12/11	whittle	AS BUILT
B7	12/08/11	whittle	PNH-701
B	11/11/11	whittle	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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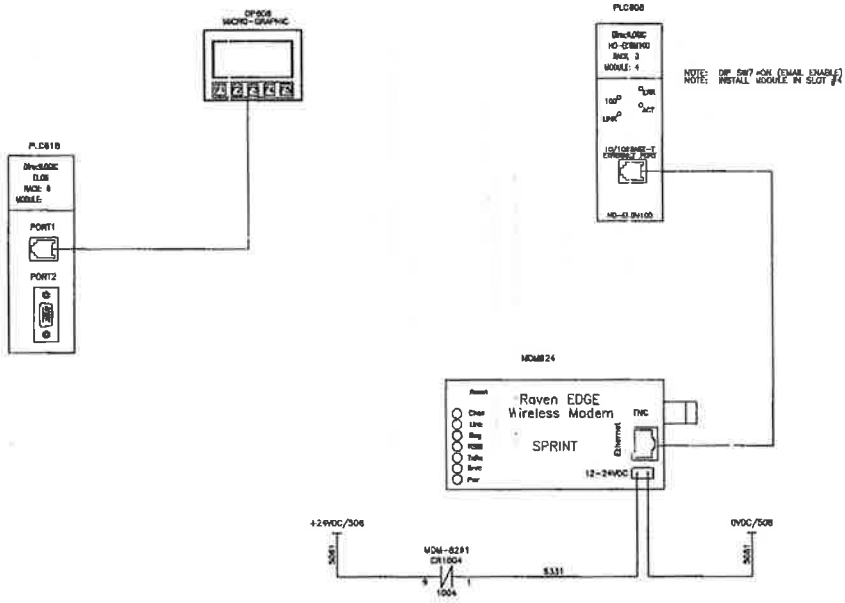
PROJECT: 201097 Shell Products - Roxana
DRAWING NO:
JOB NO: 201097
PAGE DESCRIPTION: 24VDC POWER SUPPLY
PAGE: 5 of 13



WIRE LEGEND	NOTES:
BLACK: POWER	
RED: CONTROL	
WHITE: NEUTRAL	
BLUE: +24VDC & I.S.(Intrinsically Safe)	
BL/WH: 0VDC	
YELLOW: INTERLOCKS	

REV	DATE	BY	DESCRIPTION
C	12/12/11	jwhite	AS BUILT
B2	12/08/11	jwhite	PRH-701
B	11/11/11	jwhite	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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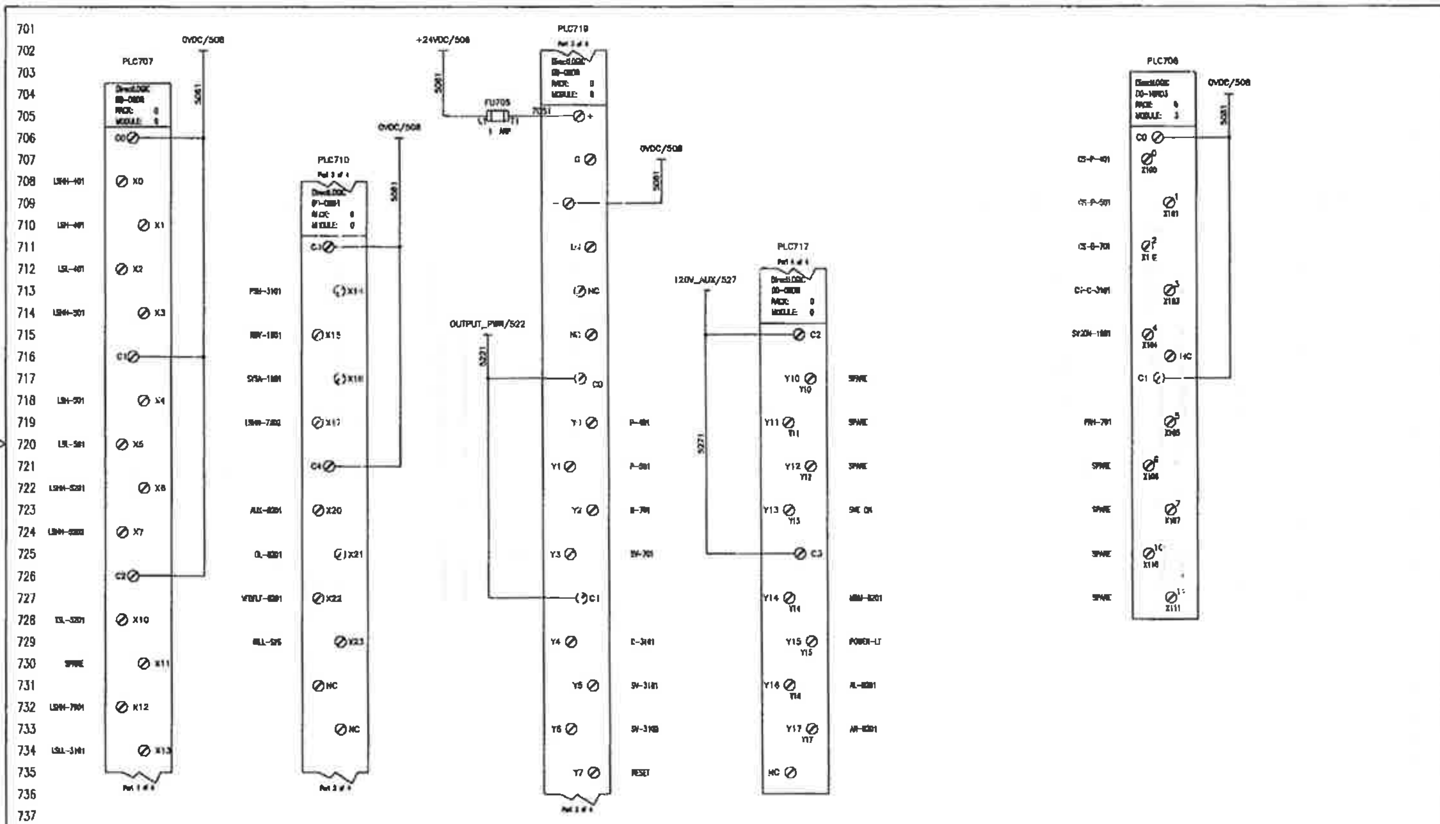
PROJECT: 201097
Shell Products - Roxana

DRAWING NO: 201097

PAGE DESCRIPTION: MODEM/TOUCH-SCREEN CONNECTIONS

PAGE: 6 OF 13



WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	13/12/11		AS BUILT
B2	12/06/11		PNH-701
B	11/11/11		PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

MLE EQUIPMENT

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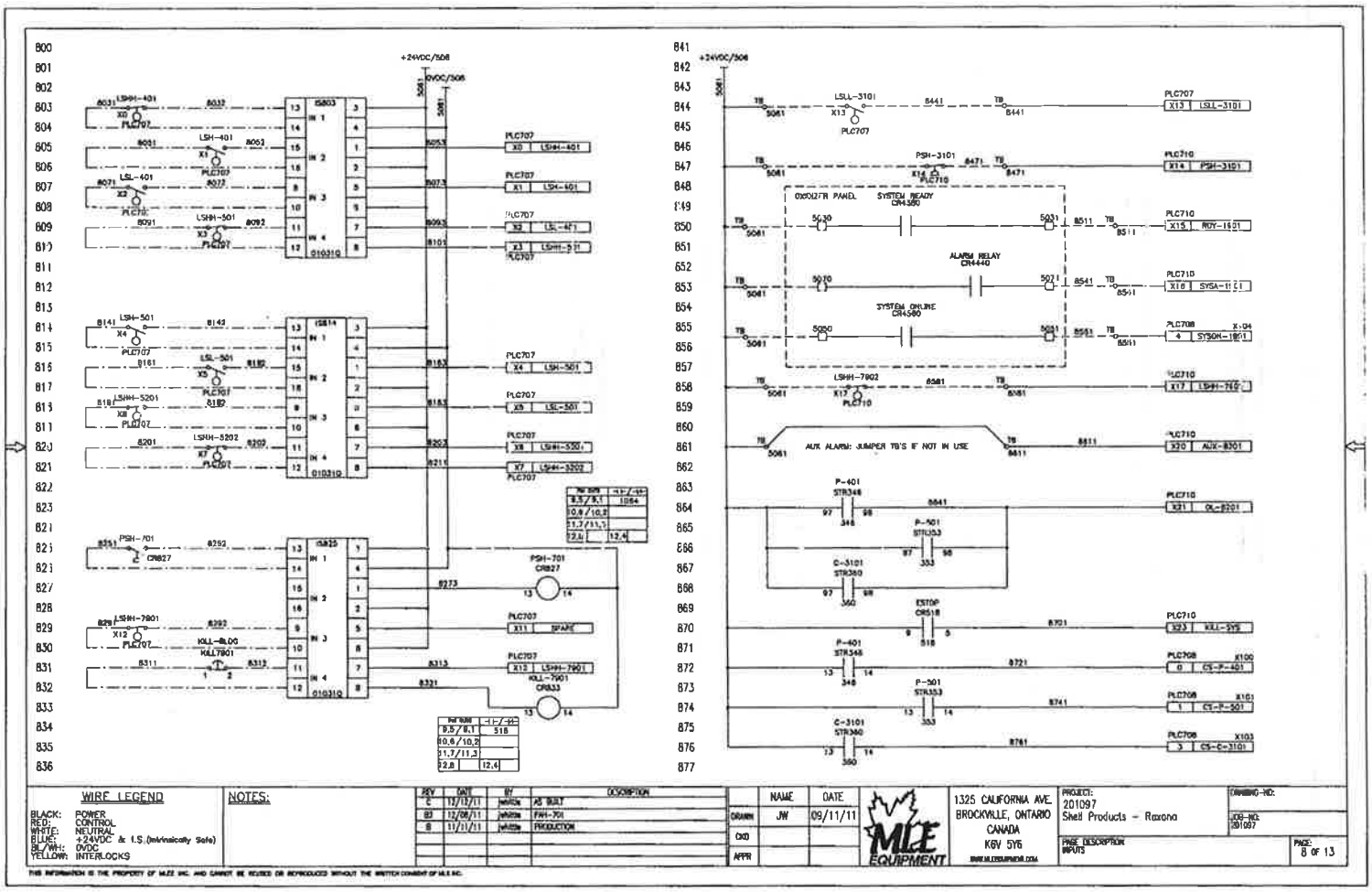
CANADA
K6V 5Y6

PROJECT: 201097
Shell Products - Roxano

PAGE DESCRIPTION: PLC LAYOUT

PAGE: 7 of 13



WIRE LEGEND	NOTES:
BLACK: POWER RED: CONTROL WHITE: NEUTRAL BLUE: +24VDC & I.S.(Intrinsically Safe) BL/WH: 0VDC YELLOW: INTERLOCKS	

REV	DATE	BY	DESCRIPTION
C	12/12/11	jwhite	AS BUILT
B2	12/08/11	jwhite	FAH-701
B	11/21/11	jwhite	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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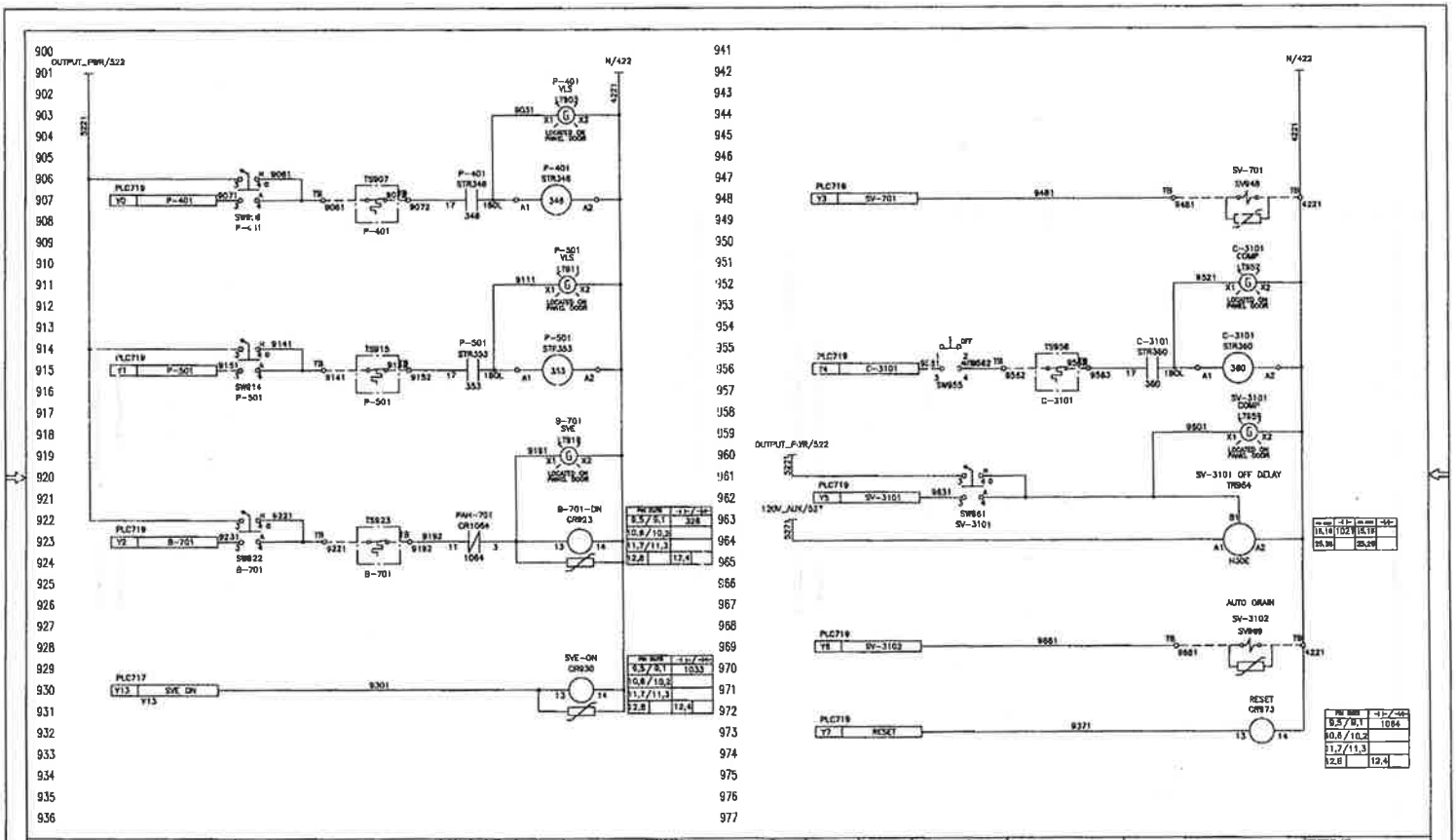
PROJECT: 201097
Shell Products - Roxana

DRAWING NO:
JOB NO: 201097

PAGE DESCRIPTION: INPUTS

PAGE: 8 OF 13


OUTPUT_PWR/522
N/422
P-401 VLS
P-501 VLS
S-701 SVE
SVE-ON CR930
B-701-ON CR923
FAN-701 CR1064
SV-701
C-3101 COMP
SV-3101 COMP
SV-3101 OFF DELAY TR964
AUTO GRAIN SV-3102
RESET CR973
WIRE LEGEND
BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS
NOTES:
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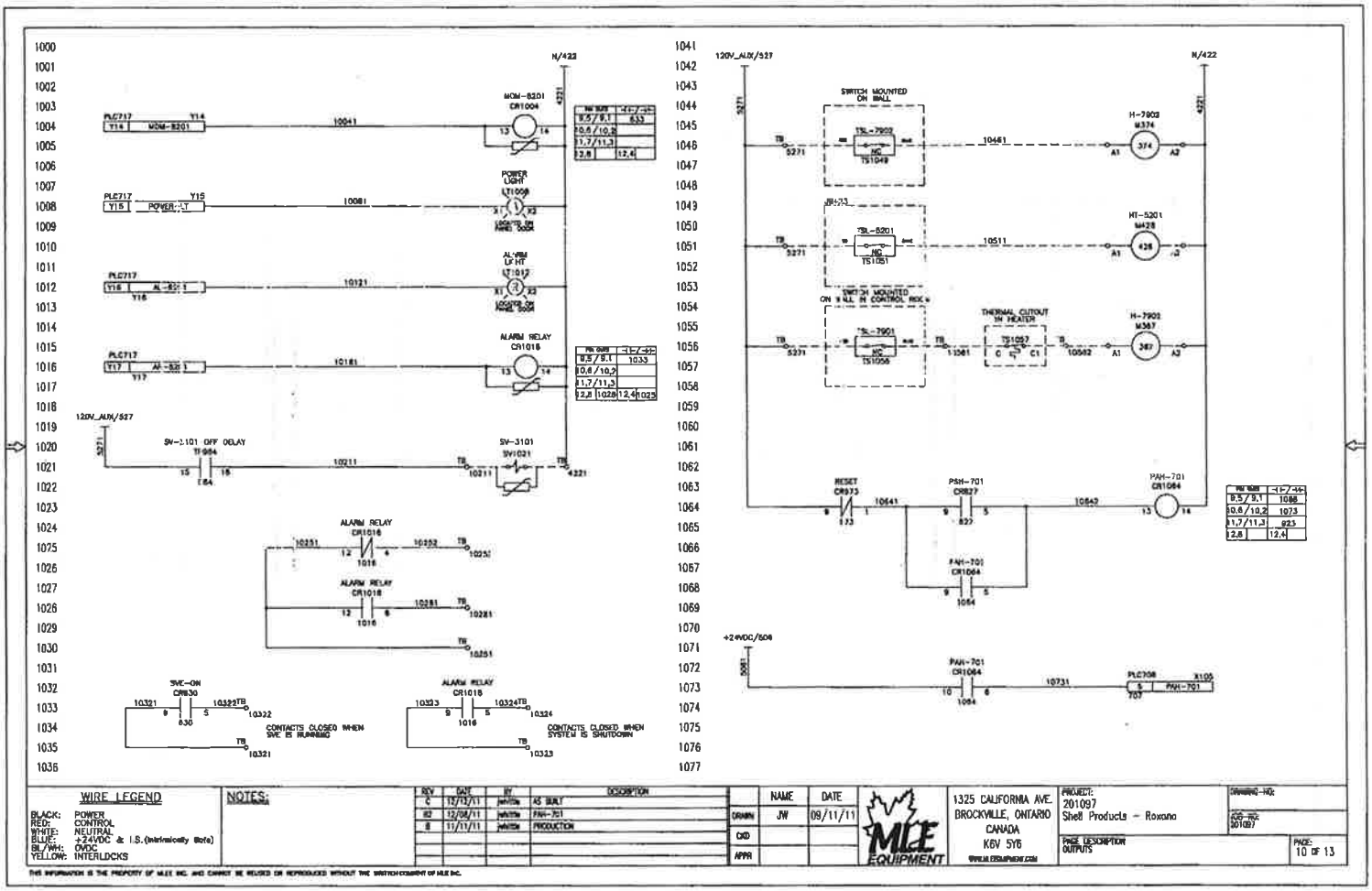
PROJECT: 201097 Shell Products - Roxana
DRAWING-NO:
JOB-NO: 201097
PAGE DESCRIPTION: OUTPUTS
PAGE: 9 of 13



WIRE LEGEND	
BLACK:	POWER
RED:	CONTROL
WHITE:	NEUTRAL
BLUE:	+24VDC & I.S.(Intrinsically Safe)
BL/WH:	0VDC
YELLOW:	INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/12/11	JW/DW	AS BUILT
B2	12/08/11	JW/DW	FAH-701
B	11/11/11	JW/DW	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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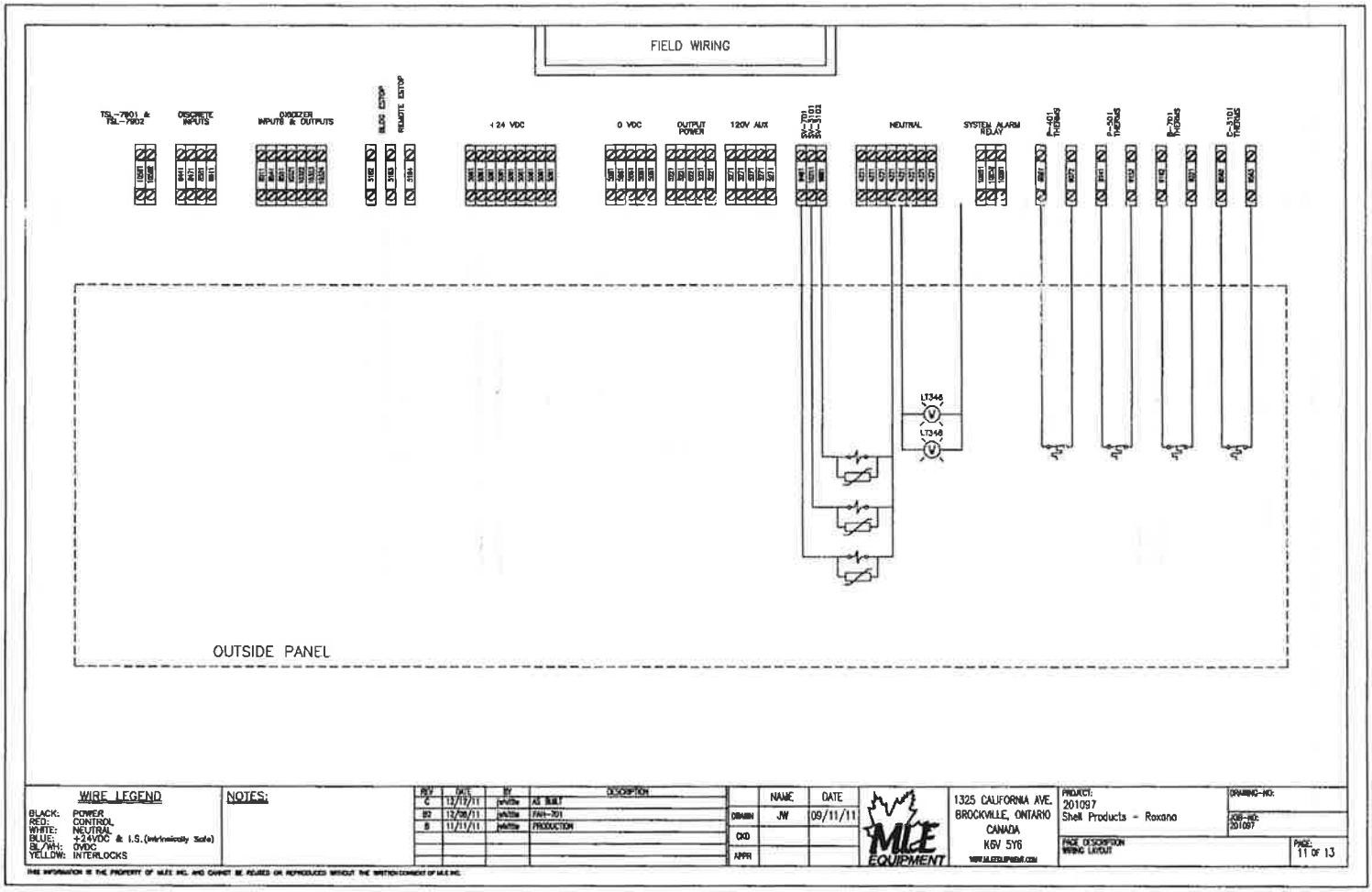
Shell Products - Roxana

DRAWING NO: 201097

PAGE DESCRIPTION: OUTPUTS

PAGE: 10 OF 13



WIRE LEGEND	
BLACK:	POWER
RED:	CONTROL
WHITE:	NEUTRAL
BLUE:	+24VDC & I.S.(intrinsically Safe)
BL/WH:	0VDC
YELLOW:	INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/19/11	[illegible]	AS BUILT
B2	12/08/11	[illegible]	FAN-701
B	11/11/11	[illegible]	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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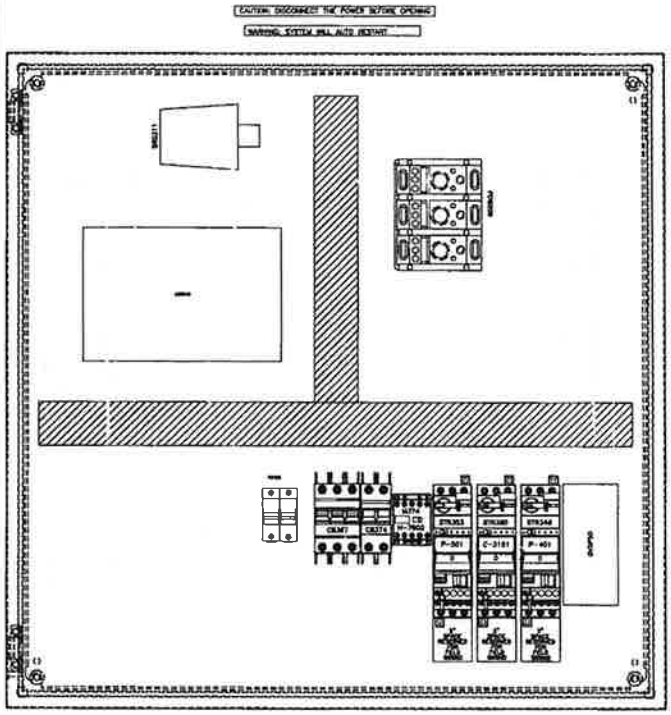
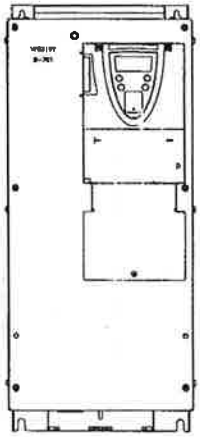
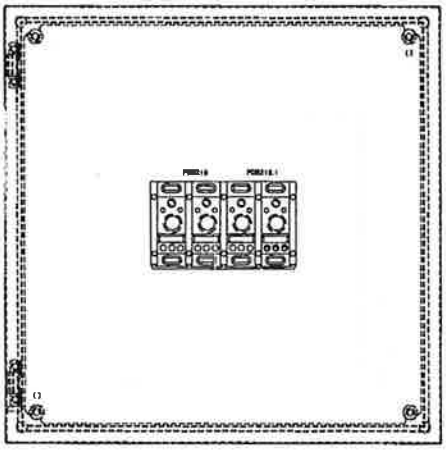
PROJECT: 201097 Shell Products - Roxana
DRAWING-NO:
JOB-NO: 201097
PAGE DESCRIPTION: WIRING LAYOUT
PAGE: 11 OF 13





HEAT TRACE PANEL



NOTE 1: NEMA 4 LOCKABLE PANELS
NOTE 2: VFD MOUNTED ON CONTROL ROOM WALL

WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S. (Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

REV	DATE	BY	DESCRIPTION
C	12/12/11	jwhittle	AS BUILT
B2	12/09/11	jwhittle	FAH-701
B	11/11/11	jwhittle	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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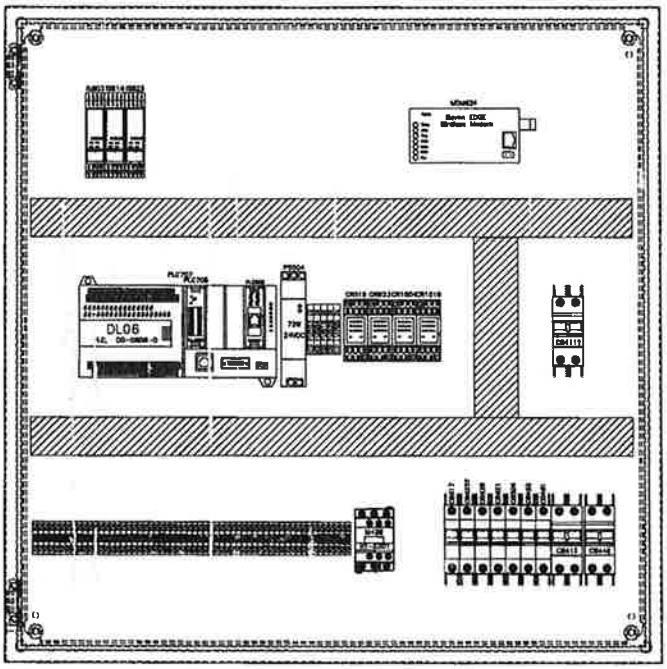
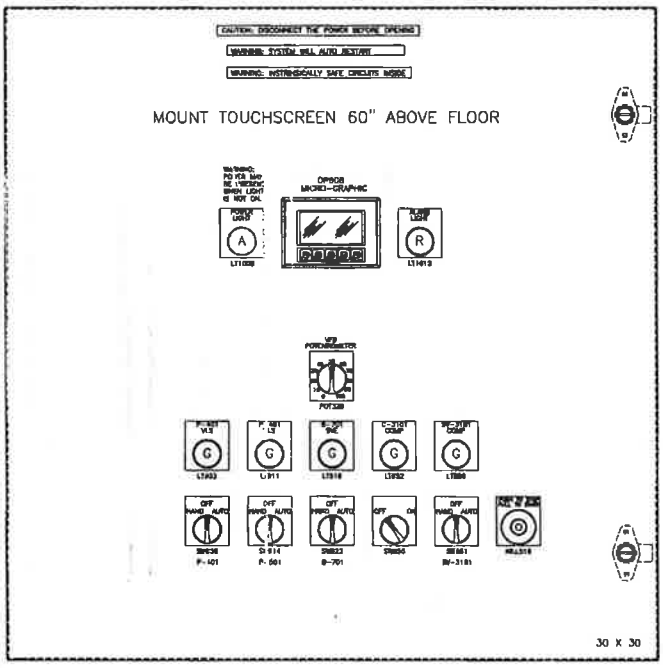
K6V 5Y6

PROJECT: 201097 Shell Products - Roxana
DRAWING-NO:
JOB-NO: 201097
PAGE DESCRIPTION: 480V PANEL
PAGE: 12 OF 13

Q.4





NOTE 1: NEMA 4 LOCKABLE PANELS
NOTE 2: LIGHTS, SWITCHES AND TOUCHSCREEN MOUNTED ON OUTER PANEL DOOR

WIRE LEGEND	NOTES:
BLACK: POWER RED: CONTROL WHITE: NEUTRAL BLUE: +24VDC & I.S. (Intrinsically Safe) BL/WH: 0VDC YELLOW: INTERLOCKS	

REV	DATE	BY	DESCRIPTION
C	12/17/11	JWHITE	AS BUILT
B2	12/08/11	JWHITE	PWH-701
B	11/11/11	JWHITE	PRODUCTION

	NAME	DATE
DRAWN	JW	09/11/11
CKD		
APPR		

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PROJECT: 201097 Shell Products - Roxano
DRAWING NO:
JOB NO: 201097
PAGE DESCRIPTION: CONTROL PANEL
PAGE: 13 OF 13

APPENDIX B

SVE Equipment Cut Sheets

Legend® Series

Positive Displacement Blowers & Vacuum Pumps

GARDNER DENVER®

Experience Proven Results

Sutorbilt Legend Series

Setting the Industry Standard for Over 70 Years

Gardner Denver's Sutorbilt® Legend® line of rotary positive displacement lobe blowers and vacuum pumps are the result of more than seventy years experience in the design, manufacture and support of superior industrial equipment.

Why the Sutorbilt line of blowers and vacuum pumps earned the name "Legend."

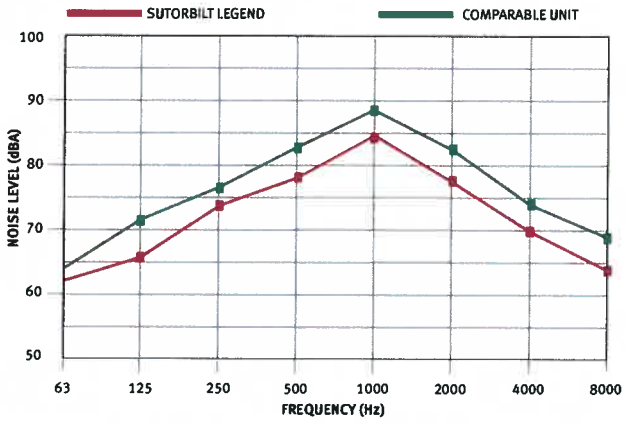
- Backed by one of the largest distributor networks in the industry
- Every Sutorbilt Legend blower/vacuum pump is built under rigid ISO 9001:2000 quality standards
- Each Legend is individually tested to meet rigorous performance specifications
- Requested by leading Original Equipment Manufacturers (OEMs) worldwide for a wide range of applications, due to the ability to customize the Legend to their specifications while meeting strict performance requirements
- A Legend is at the heart of an ever-expanding variety of air solutions working every minute of every day around the globe
- Available in 20 sizes with 4 different configurations
- The Legend Series delivers
  - Pressure to 15 psig
  - Vacuum to 16" Hg
  - Flows to 3,015 scfm

Proven Performance. Global Applications. Local Support.

Quiet Operation

The sound data shown (above, right) compares the Legend (red) and a comparably sized blower (green) operating at 3,275 rpm and 12 psig.

- Improved blower design reduces the sound pressure output of the Legend blower
- Typical reduction is 3 dBA which represents 50% less noise than the competition



Superior Local Sales and Service

- Extensive network of authorized Gardner Denver/ Sutorbilt distributors
- Offers the most convenient local sales and service support of anyone in the industry
- Factory trained professionals are experts in blower/ vacuum pump technology
- Providing system installation guidance, troubleshooting and optimization recommendations for new or existing applications

Even a "Legendary" Warranty

Every Sutorbilt Legend Series blower/vacuum pump is covered by a "Legendary" warranty: 24 months from the date of shipment or 18 months from the date of installation.

Industry	Application
Aquaculture	Aeration
Cement & Lime	Fluidization & Conveying
Chemical	Vacuum Processing & Conveying
Coal Bed/Landfill	Methane Gas Recovery
Dairy	Automated Milking
Dry Bulk Hauling	Trailer Unloading & Aeration
Environmental Services	Sewer Cleaning & Portable Restroom Services
Industrial	Material Vacuuming
Milling & Baking	Blending & Conveying
Oil & Gas	Gas Collection & Sparging
Power Generation	Fly Ash Conveying & Aeration
Process Gas	Gas Boosting
Pulp & Paper	Chip Conveying & Process Vacuum
Resin & Plastic	Processing & Conveying
Soil Remediation	Vacuum Extraction & Sparging
Vacuum Excavation	Potholing & Slurry Recovery
Wastewater	Aeration & Backwashing

The above table illustrates industries which depend upon the Sutorbilt® Legend® to deliver clean, oil-free air to a wide range of global applications.

Legendary Design Features

1 High-strength impeller case is heavily ribbed and machined from a single piece of cast iron and features oversized dowel pins for precise mounting and alignment of head plates.

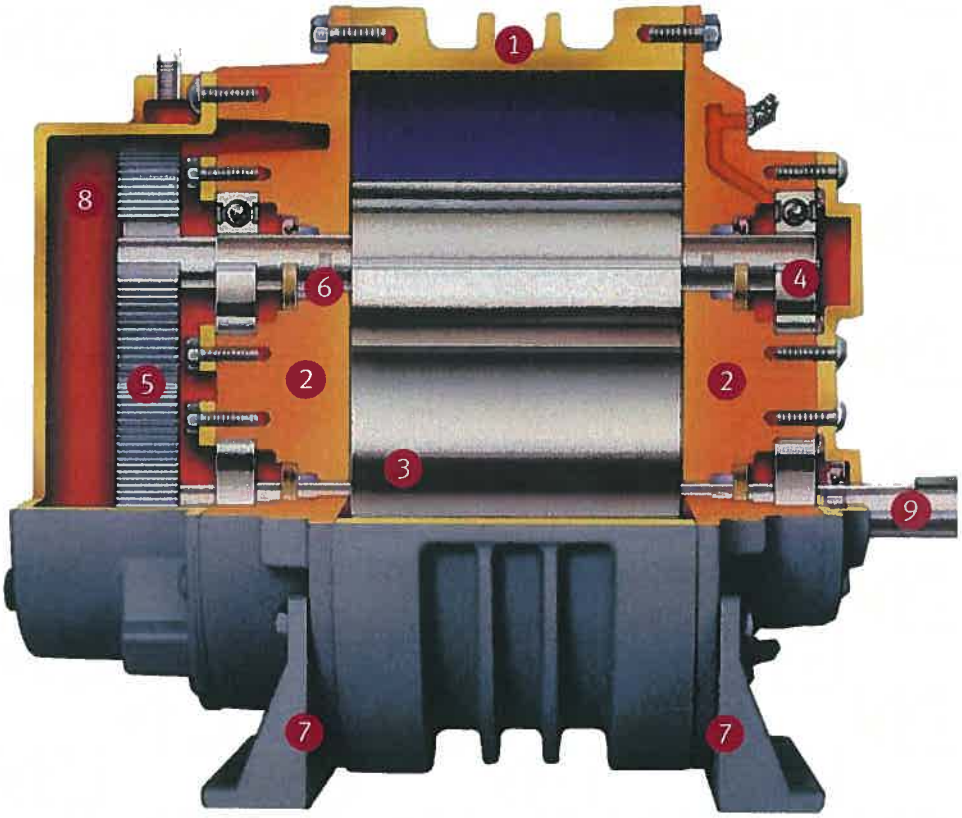
These features result in reduced noise and more stable, vibration-free operation.

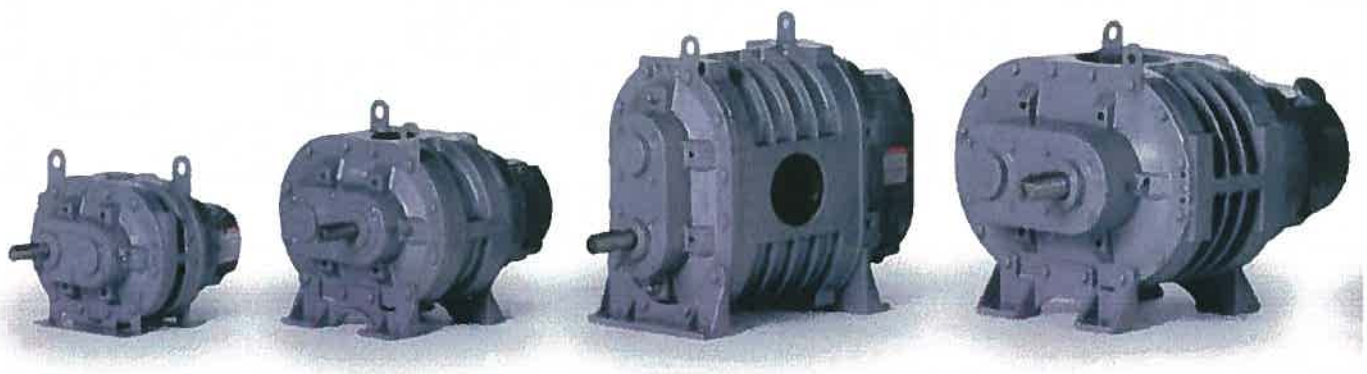
2 Head plates, machined from cast iron, are ground on the interior surface to precise operating tolerances. Bearing fits are machined into head plates to assure exact bearing positioning.

This ensures accurate, fixed-dimension clearances through all blower operating conditions and temperature ranges.

3 Impellers are machined from cast iron to an exact profile and are permanently fastened to steel shafts. They are dynamically balanced for smooth operation in any assembled position.

This provides extra strength and rigidity to handle continuous maximum loads without fatigue or deflection.





2MP LHC 3MP RHC 4LVP BHC 5MP RHC

4 Anti-friction bearings are used exclusively. Smaller models are fitted with single-row ball bearings and cylindrical roller bearings; large models have double-row ball bearings and spherical roller bearings.

Optimum bearing selection provides longer blower life and added overhung shaft load capacity.

5 Timing gears, precision machined from alloy steel forgings, are permanently pinned to the shafts.

This assures non-slip timing even under the most strenuous loading conditions.

6 High temperature Viton® oil seals.

These maximize the seal life in continuous, severe-duty applications to provide leak-free operation.

7 Flex-MountTM design is adaptable to either vertical or horizontal installation.

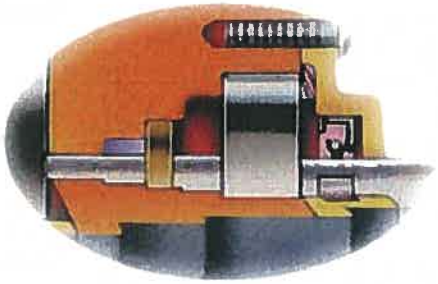
The feet are precisely machined and match the footprints of many competitive units.

8 Timing gears and gear end bearings are splash lubricated utilizing an abundant oil reservoir. A graphite gasketed, oil-tight housing encloses the timing gears. Drive end bearings are grease lubricated through fittings. Lip-type seals prevent oil and grease from entering the impeller chamber.

Superior gear and bearing lubrication is assured at all operating conditions with minimal maintenance.

9 High strength steel drive shaft is extended for V-belt drive or direct connection.

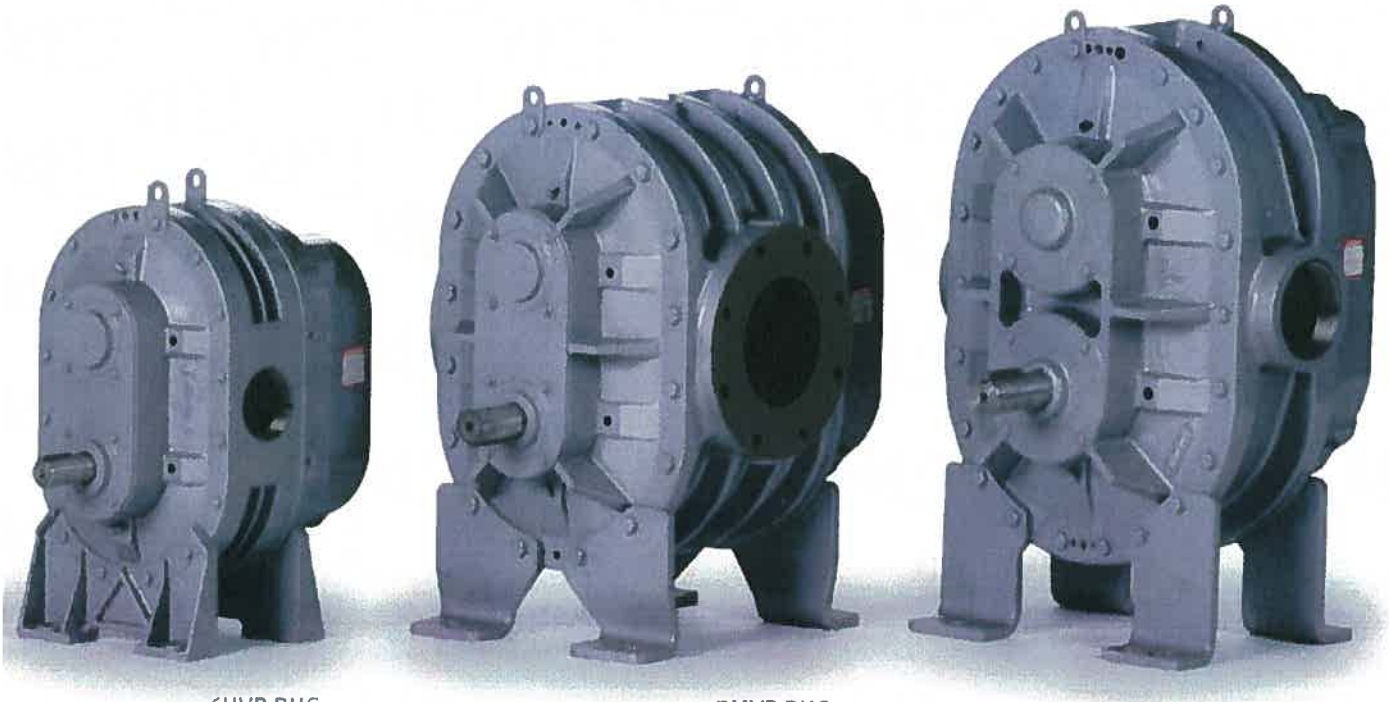
This feature provides greater blower durability and installation flexibility.



Available with Mechanical Gas Seals

The Legend design accommodates mechanical gas seals for critical gas applications with proven results based on a large installed base.

This field proven seal design allows trouble-free operation in critical gas applications.

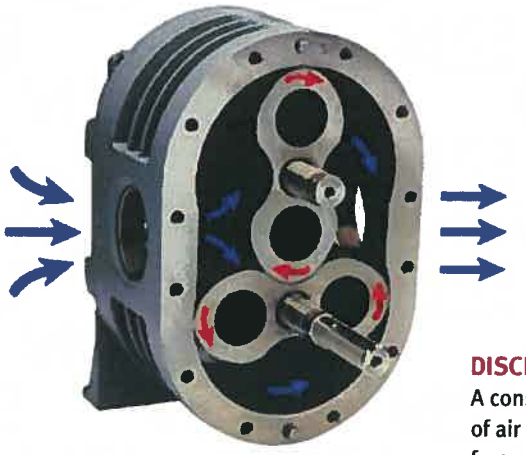


6HVP BHC

7MVP BHC

8HVP BHC

The Sutorbilt Legend Design



INTAKE
A constant volume of air or gas is drawn into the cylinder by the action of the turning impellers.

DISCHARGE
A constant volume of air or gas is forced out through the discharge port.

TRANSFER
A constant volume of trapped air or gas is transferred around the cylinder to the discharge port.

The Sutorbilt PD Cycle

- Two figure-eight impellers turn in opposite directions within a machined housing
- Transferring a constant volume of air or gas from inlet to discharge with every rotation of the blower drive shaft
- No lubrication within the cylinder is required
- Rotating components are held in close tolerance do not contact each other
- Impeller positioning is maintained by precision timing gears affixed to each impeller shaft
- Gear and bearing lubrication occurs externally to the cylinder assuring clean, oil-free gas delivery under all operating conditions

Flex-Mount™ Design Provides Maximum Installation Versatility

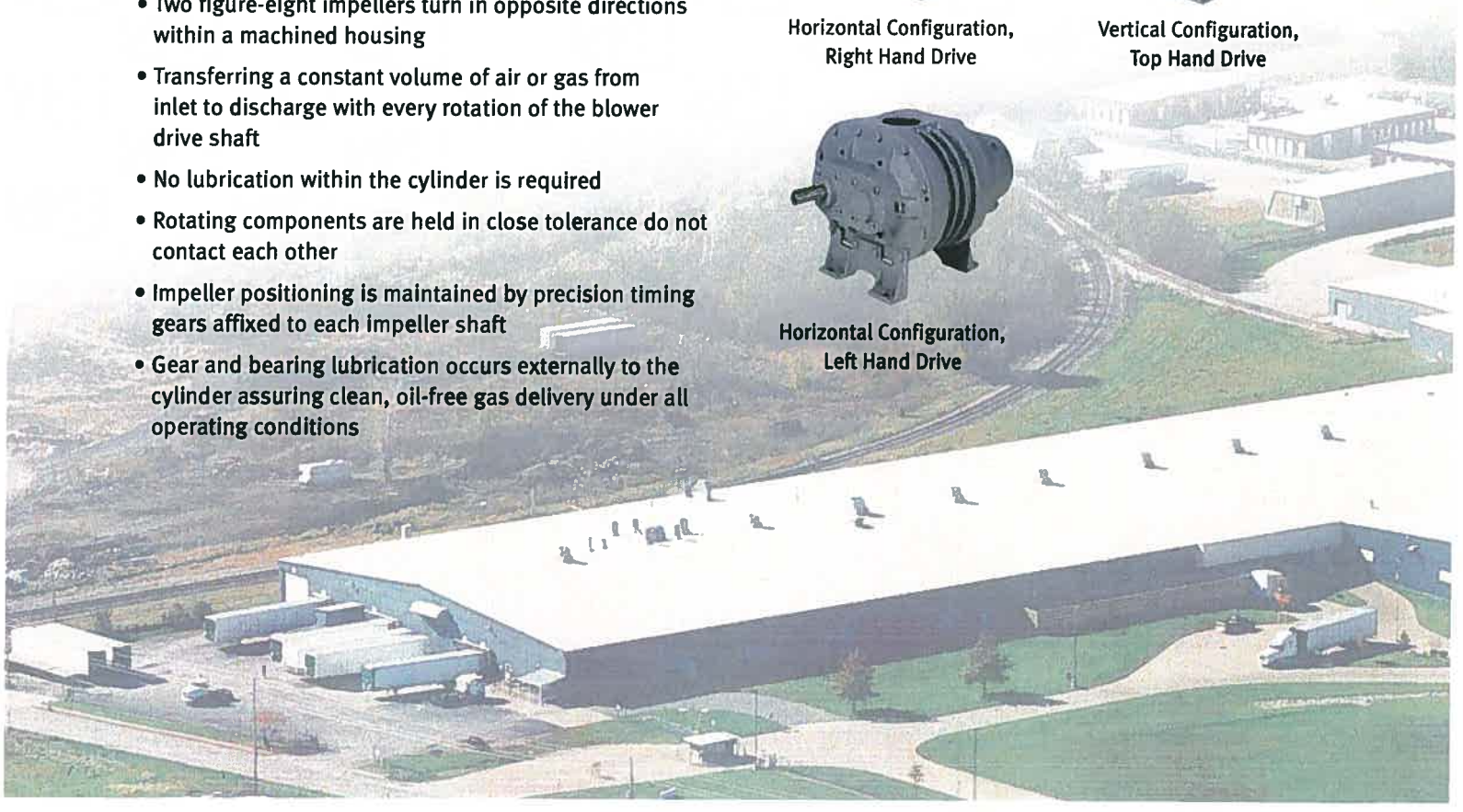
- Flex-MountTM design allows the Legend application flexibility
- Creating interchange-ability on existing and new applications
- Compatible as replacements for most competitive installations

Vertical Configuration, Bottom Hand Drive

Horizontal Configuration, Right Hand Drive

Vertical Configuration, Top Hand Drive

Horizontal Configuration, Left Hand Drive



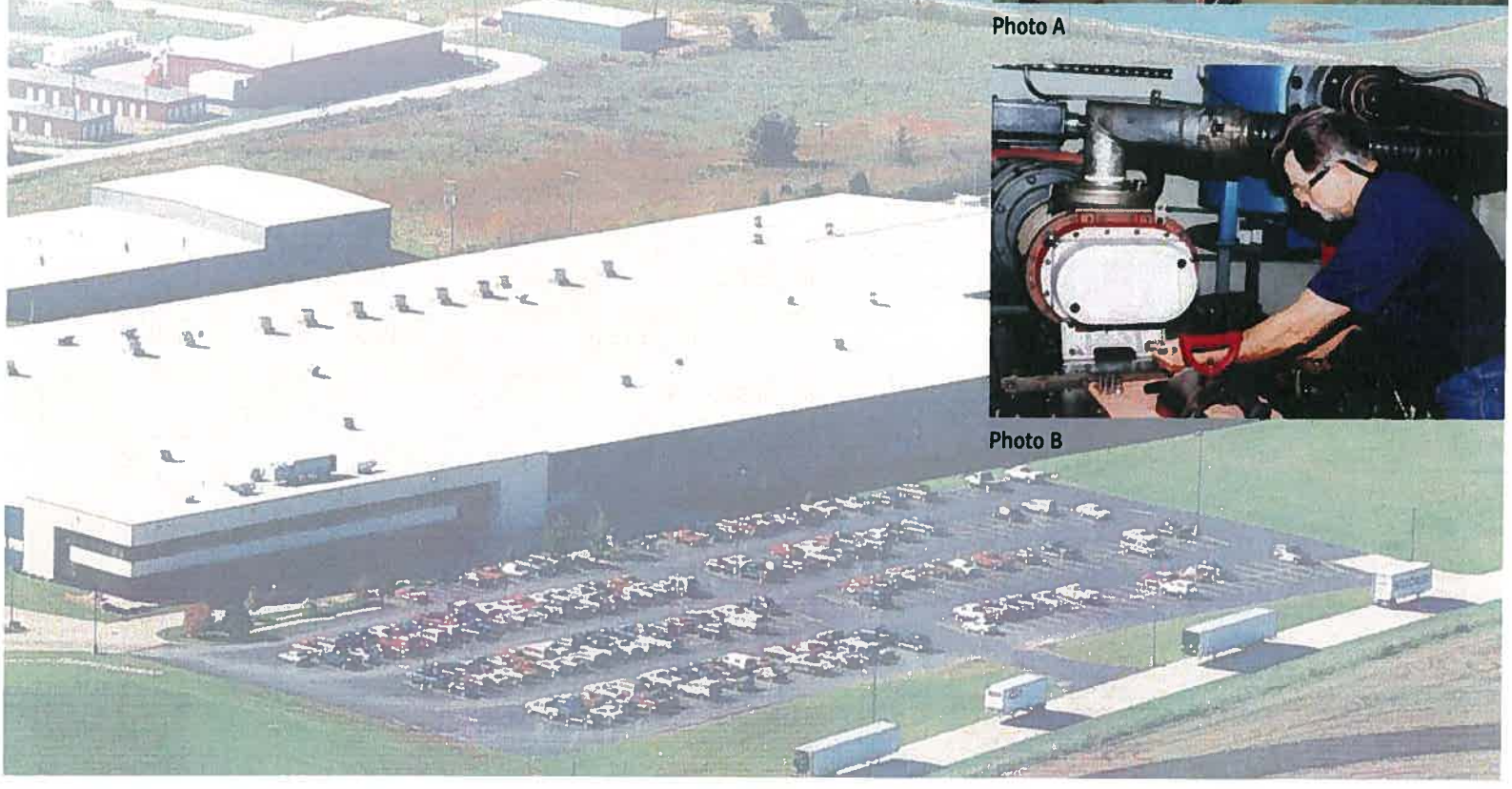
State-of-the-Art Quality

Gardner Denver's Sutorbilt Legend blowers and vacuum pumps are engineered and manufactured under strict ISO 9001:2000 quality standards in our 330,000 square feet state-of-the-art facility in Sedalia, MO (photo below)

- Gardner Denver makes it a priority to invest in quality trained employees and precision machinery
- Our Flexible Machining System (FMS) assures consistent production of the highest quality Legend components
- Extra attention to detail is found throughout the manufacturing process like utilizing advanced coordinate measuring equipment (photo A)
- Legend components are subjected to quality inspections before they are assembled
- Prior to shipment, every Legend is tested against rigid standards using our advanced computer automated testing stations (photo B)

Photo A

Photo B



Sutorbilt Legend Pressure Performance Data

LOW PRESSURE UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT./REV.	RPM	2 PSIG		3 PSIG		4 PSIG		5 PSIG		6 PSIG		7 PSIG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2LP 2LVP	2"-S	0.035	2,800	76	1.1	71	1.6	67	2.1	63	2.5	59	3.0	56	3.5
			3,250	91	1.3	86	1.8	82	2.4	79	2.9	75	3.4	72	4.0
			3,560	102	1.4	97	2.0	93	2.6	89	3.2	86	3.7	83	4.3
			5,275	162	2.0	157	2.8	153	3.7	149	4.6	146	5.3	143	6.1
3LP 3LVP	2½"-S	0.104	1,760	149	1.9	142	2.8	135	3.7	130	4.5	124	5.2	120	6.1
			2,265	202	2.4	194	3.5	188	4.7	182	5.6	177	6.7	172	7.8
			2,770	254	2.9	247	4.3	240	5.5	235	6.8	230	8.2	225	9.6
			3,600	341	3.7	333	5.3	327	7.1	321	8.9	316	10.6	311	12.4
4LP 4LVP	3"-S	0.170	1,760	253	3.0	243	4.5	234	5.7	227	7.1	220	8.5	213	9.9
			2,190	326	3.7	316	5.3	307	7.1	300	8.8	293	10.6	286	12.4
			2,620	400	4.4	389	6.3	381	8.4	373	10.6	366	12.7	360	14.8
			3,600	566	5.8	556	8.7	547	11.6	539	14.5	533	17.4	526	20.3
5LP 5LVP	4"-S	0.350	1,500	463	5.2	449	7.5	438	10.0	427	12.4	418	14.9	409	17.4
			1,760	554	5.8	540	8.8	529	11.7	518	14.6	509	17.5	500	20.4
			2,100	673	7.0	659	10.5	648	13.9	637	17.4	628	20.9	619	24.4
			2,850	936	9.5	922	14.2	910	18.9	900	23.6	890	28.4	882	33.1
6LP 6LVP	6"-F	0.718	1,170	739	8.0	716	11.9	697	15.9	680	19.9	664	23.9	650	27.9
			1,760	1,162	12.0	1,139	18.0	1,120	24.0	1,103	29.9	1,088	35.9	1,074	41.9
			1,930	1,284	13.1	1,261	19.7	1,242	26.3	1,225	32.8	1,210	39.4	1,196	46.0
			2,350	1,586	16.0	1,563	24.0	1,544	32.0	1,527	40.0	1,512	48.0	1,497	56.0
7LP 7LVP	8"-F	1.200	1,170	1,277	13.3	1,248	20.0	1,224	16.6	1,203	33.3	1,184	39.9		
			1,465	1,631	16.7	1,602	25.0	1,578	33.3	1,557	41.7	1,538	50.0		
			1,760	1,985	20.0	1,956	30.0	1,932	40.0	1,911	50.1	1,892	60.1		
			2,050	2,333	23.3	2,304	35.0	2,280	46.6	2,259	58.3	2,240	70.0		
8LP 8LVP	10"-F	1.740	880	1,366	14.5	1,329	21.8	1,298	29.0	1,271	36.3	1,246	43.5		
			1,170	1,871	19.3	1,834	28.9	1,803	38.6	1,775	48.2	1,750	57.9		
			1,375	2,228	22.7	2,191	34.0	2,159	45.4	2,132	56.7	2,107	68.0		
			1,800	2,967	29.7	2,930	44.5	2,899	59.4	2,871	74.2	2,847	89.1		

MEDIUM PRESSURE UNITS

SIZE	DIA.INLET & OUTLET	DISPL.CU. FT./REV.	RPM	7 PSIG		9 PSIG		10 PSIG		12 PSIG		13 PSIG		14 PSIG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2MP 2MVP	1"-S	0.017	2,800	25	1.7	22	2.1								
			3,250	33	1.9	30	2.5	28	2.7						
			3,560	38	2.1	35	2.7	34	3.0						
			5,275	67	3.1	64	3.9	63	4.4	60	5.1				
3MP 3MVP	2"-S	0.060	1,760	64	3.6	59	4.6								
			2,265	95	4.6	89	5.8	87	6.4						
			2,770	125	5.5	119	7.1	117	7.9	112	9.5				
			3,600	175	7.2	169	9.2	167	10.2	162	12.3				
4MP 4MVP	2½"-S	0.117	1,760	144	6.8	136	8.8	132	9.8						
			2,190	194	8.5	186	10.9	182	12.1						
			2,620	245	10.2	236	13.1	233	14.5						
			3,600	359	14.0	351	18.0	347	20.0						
5MP 5MVP	4"-S	0.210	1,500	237	10.5	227	13.4	222	14.9	213	17.9	209	19.4		
			1,760	292	12.3	281	15.8	277	17.5	268	21.0	263	22.8		
			2,100	363	14.6	353	18.8	348	20.9	339	25.1	335	27.2		
			2,850	521	19.9	510	25.5	506	28.4	497	34.0	493	36.9		
6MP 6MVP	5"-S	0.383	1,170	332	14.9	316	19.1	309	21.2	296	25.5	289	27.6	283	29.7
			1,760	558	22.4	542	28.8	535	32.0	522	38.3	515	41.5	509	44.7
			1,930	622	24.5	607	31.5	600	35.0	587	42.0	580	45.5	574	49.1
			2,350	784	29.9	768	38.4	761	42.7	748	51.2	741	55.5	735	59.7
7MP 7MVP	6"-F	0.733	1,170	693	28.5	671	36.6	661	40.7						
			1,465	909	35.6	887	45.8	877	50.9						
			1,760	1,125	42.8	1,103	55.0	1,093	61.1						
			2,050	1,338	49.9	1,316	64.1	1,306	71.2						
8MP 8MVP	8"-F	1.040	880	709	30.4	681	39.0	669	43.4						
			1,170	1,011	40.4	983	51.9	970	57.7						
			1,375	1.224	47.4	1.196	61.0	1,183	67.8						
			1,800	1,666	62.1	1,638	79.9	1,625	88.7						

HIGH PRESSURE UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT./REV.	RPM	7 PSIG		8 PSIG		9 PSIG		11 PSIG		13 PSIG		15 PSIG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
3HP 3HVP	1¼"-S	0.045	1,760	46	2.6	44	3.0	41	3.4						
			2,265	69	3.4	66	3.9	64	4.3	60	5.3				
			2,770	91	4.1	89	4.7	87	5.3	83	6.5				
			3,600	129	5.4	126	6.1	124	6.9	120	8.4	117	10.0	113	11.5
4HP 4HVP	1½"-S	0.069	1,760	80	4.0	77	4.6	74	5.2						
			2,190	110	5.0	107	5.7	104	6.4	99	7.9				
			2,620	139	6.0	137	6.9	134	7.7	129	9.4	124	11.1		
			3,600	207	8.2	204	9.4	201	10.6	196	13.0	192	15.3	188	17.7
5HP 5HVP	2½"-S	0.140	1,500	154	7.0	151	8.0	147	9.0	140	10.9				
			1,760	191	8.2	187	9.3	183	10.5	177	12.8	171	15.2	165	17.5
			2,100	238	9.8	235	11.1	231	12.5	224	15.3	218	18.1	213	20.9
			2,850	343	13.2	340	15.1	336	17.0	329	20.8	323	24.6	318	28.4
6HP 6HVP	3"-S	0.227	1,170	188	8.8	182	10.1	177	11.3	168	13.8	159	16.4		
			1,760	321	13.3	316	15.1	311	17.0	302	20.8	293	24.6	285	28.4
			1,930	360	14.5	355	16.6	350	18.7	340	22.8	332	27.0	324	31.1
			2,350	455	17.7	450	20.2	445	22.8	436	27.8	427	32.9	419	37.9
7HP 7HVP	4"-S	0.367	1,170	332	14.2	326	16.3	319	18.3	308	22.4	297	26.5	287	30.5
			1,465	441	17.8	434	20.4	428	22.9	416	28.0	405	33.1	396	38.2
			1,760	549	21.4	542	24.5	536	27.6	524	33.7	514	39.8	504	45.9
			2,050	655	25.0	649	28.5	642	32.1	631	39.2	620	46.4	610	53.5
8HP 8HVP	4"-S	0.566	880	363	16.5	354	18.9	345	21.2	329	26.0	315	30.7	301	35.4
			1,170	528	22.0	518	25.1	509	28.3	493	34.5	479	40.8	465	47.1
			1,375	644	25.8	634	29.5	626	33.2	609	40.6	595	48.0	581	55.3
			1,800	884	33.8	875	38.6	866	43.5	850	53.1	835	62.8	822	72.4

Performance based on standard conditions: Sea Level.14.7 PSIA, 68°F inlet Temperature, 36% Relative Humidity. For performance with gases other than air or at non-standard conditions, contact your Authorized Sutorbilt representative. S=Screwed connections std. NPT. F=flange connections. intake and outlet pipe connections are same type and size.

Sutorbilt Legend Vacuum Performance Data

LOW VACUUM UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT./REV.	RPM	2 "Hg		4 "Hg		8 "Hg		10 "Hg		12 "Hg		14 "Hg	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2LP 2LVP	2"-S	0.035	2,800	82	0.7	74	1.1	61	2.0	55	2.5				
			3,250	98	0.7	90	1.3	77	2.3	71	2.8	64	3.4		
			3,560	108	0.8	101	1.4	88	2.5	82	3.1	75	3.7		
			4,165	130	0.9	122	1.6	109	2.9	103	3.6	96	4.3		
			5,275	168	1.1	161	1.9	148	3.6	142	4.5	135	5.2	128	6.0
3LP 3LVP	21/2"-S	0.104	1,760	158	1.1	147	1.9	128	3.6	118	4.5	108	5.1		
			2,265	211	1.3	200	2.4	180	4.6	171	5.5	160	6.6		
			2,770	264	1.5	252	2.9	233	5.4	223	6.7	213	8.1		
			3,600	350	1.9	338	3.7	319	7.0	309	8.7	299	10.5	288	12.2
4LP 4LVP	3"-S	0.170	1,760	266	1.6	250	3.0	224	5.6	211	7.0	197	8.4		
			2,190	339	1.9	323	3.7	297	6.9	284	8.7	270	10.4		
			2,620	412	2.3	396	4.3	370	8.3	357	10.4	343	12.4	329	14.5
			3,600	579	3.1	563	5.7	537	11.4	524	14.3	510	17.1	495	20.0
5LP 5LVP	4"-S	0.350	1,500	480	2.6	459	5.1	424	9.8	406	12.2	388	14.7		
			1,760	571	3.1	550	5.7	515	11.5	497	14.3	479	17.2	459	20.1
			2,100	690	3.6	669	6.8	634	13.7	616	17.1	598	20.5	578	24.0
			2,850	953	4.8	932	9.3	896	18.6	879	23.2	860	27.9	840	32.5
6LP 6LVP	6"-F	0.718	1,170	766	4.1	732	7.8	674	15.7	645	19.6	615	23.5		
			1,760	1,190	5.9	1,115	11.8	1,097	23.5	1,068	29.4	1,038	35.3	1,005	41.2
			1,930	1,312	6.5	1,278	12.9	1,219	25.8	1,191	32.3	1,160	38.7	1,127	45.2
			2,350	1,614	7.9	1,579	15.7	1,521	31.4	1,492	39.3	1,462	47.2	1,429	55.0
7LP 7LVP	8"-F	1.200	1,170	1,312	6.5	1,268	13.1	1,195	26.2	1,159	32.7	1,121	39.2		
			1,465	1,666	8.2	1,622	16.4	1,549	32.8	1,513	40.9	1,475	49.1		
			1,760	2,020	9.8	1,976	19.7	1,903	39.3	1,867	49.2	1,829	59.0		
			2,050	2,368	11.5	2,324	22.9	2,251	45.8	2,215	57.3	2,177	68.7		
8LP 8LVP	10"-F	1.740	880	1,411	7.1	1,355	14.3	1,261	28.5	1,214	35.7	1,165	42.8		
			1,170	1,916	9.5	1,860	19.0	1,766	37.9	1,719	47.4	1,670	56.9		
			1,375	2,273	11.1	2,217	22.3	2,122	44.6	2,076	55.7	2,026	66.9		
			1,800	3,012	14.6	2,953	29.2	2,862	58.4	2,815	72.9	2,765	87.6		

LOW VACUUM UNITS

SIZE	DIA. INLET &OUTLET	DISPL. CU. FT./REV.	RPM	6 "Hg		10 "Hg		12 "Hg		14 "Hg		15 "Hg		16 "Hg	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2MP 2MVP	1"-S	0.017	2,800	31	0.8	24	1.2								
			3,250	39	0.9	32	1.4								
			3,560	44	0.9	37	1.5	34	1.8						
			4,165	54	1.1	48	1.7	44	2.1	40	2.4				
			5,275	73	1.4	67	2.2	63	2.6	59	3.0	57	3.2		
3MP 3MVP	2"-S	0.060	1,760	76	1.6	63	2.6	57	3.1						
			2,265	106	2.0	93	3.3	87	3.9						
			2,770	136	2.4	124	4.0	117	4.7	110	5.4				
			3,600	186	3.1	174	5.0	167	6.0	160	7.0	156	7.5		
4MP 4MVP	21/2"-S	0.117	1,760	161	3.0	142	4.9	132	5.8						
			2,190	211	3.7	193	6.0	183	7.2						
			2,620	262	4.4	243	7.1	233	8.6	222	10.0				
			3,600	376	5.9	358	9.8	348	11.8	337	13.7	331	14.7	325	15.7
5MP 5MVP	4"-S	0.210	1,500	258	4.5	235	7.3	223	8.8	209	10.3				
			1,760	313	5.2	290	8.6	277	10.3	264	12.1				
			2,100	384	6.2	361	10.3	349	12.3	335	14.4	328	15.4		
			2,850	542	8.4	519	13.9	506	16.7	493	19.5	485	20.9	477	22.3
6MP 6MVP	5"-S	0.383	1,170	363	6.3	328	10.4	310	12.5	290	14.6	279	15.7	267	16.7
			1,760	589	9.4	554	15.7	536	18.8	516	22.0	505	23.5	493	25.1
			1,930	655	10.3	619	17.2	601	20.7	581	24.1	570	25.8	558	27.5
			2,350	815	12.6	780	21.0	762	25.2	741	29.3	731	31.4	719	33.5
7MP 7MVP	6"-F	0.733	1,170	738	12.0	688	20.0	662	24.0	633	28.0	618	30.0	601	32.0
			1,465	954	15.0	904	25.0	878	30.0	850	35.0	834	37.5	817	40.0
			1,760	1,170	18.0	1,121	30.0	1,094	36.1	1,065	42.1	1,050	45.1	1,034	48.1
			2,050	1,383	21.0	1,333	35.0	1,307	42.0	1,278	49.0	1,263	52.5	1,246	56.0
8MP 8MVP	8"-F	1.040	880	765	12.8	703	21.3	670	25.6	634	29.8	615	32.0	594	34.1
			1,170	1,067	17.0	1,005	28.3	972	34.0	936	39.7	917	42.5	896	45.3
			1,375	1,280	20.0	1,218	33.3	1,185	40.0	1,149	46.6	1,130	50.0	1,109	53.3
			1,800	1,722	26.2	1,660	43.6	1,627	52.3	1,591	61.0	1,572	65.4	1,551	69.7

LOW VACUUM UNITS

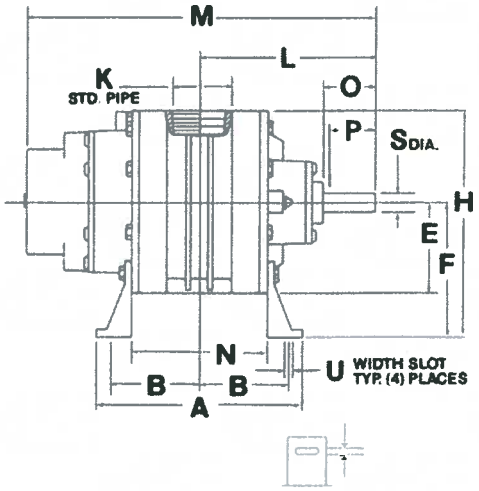
SIZE	DIA. INLET & OUTLET	DISPL. CU. FT./REV.	RPM	6 "Hg		8 "Hg		12 "Hg		14 "Hg		15 "Hg		16 "Hg	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
3HP 3HVP	11/4"-S	0.045	1,760	55	1.1	50	1.5	40	2.2						
			2,265	78	1.4	73	1.9	62	2.8						
			2,770	100	1.7	95	2.3	85	3.5	79	4.1	76	4.4		
			3,600	138	2.3	133	3.0	122	4.5	117	5.3	113	5.7	110	6.0
4HP 4HVP	11/2"-S	0.069	1,760	91	1.7	85	2.3	72	3.4						
			2,190	121	2.1	115	2.8	102	4.2	95	4.9	91	5.3		
			2,620	151	2.5	144	3.4	132	5.1	124	5.9	120	6.3		
			3,600	218	3.5	212	4.6	199	6.9	192	8.1	188	8.7	184	9.3
5HP 5HVP	21/2"-S	0.140	1,500	170	2.9	161	3.9	144	5.9	134	6.8				
			1,760	206	3.4	198	4.6	180	6.9	171	8.0	165	8.6		
			2,100	254	4.1	245	5.5	228	8.2	218	9.6	213	10.3		
			2,850	359	5.6	350	7.4	333	11.2	323	13.0	318	14.0	312	14.9
6HP 6HVP	3"-S	0.227	1,170	209	3.7	197	4.8	173	7.4	159	8.7	152	9.3		
			1,760	343	5.6	331	7.4	307	11.2	293	13.0	286	14.0	278	14.9
			1,930	381	6.1	370	8.2	345	12.2	332	14.3	325	15.3	317	16.3
			2,350	477	7.5	165	9.9	441	14.9	427	17.4	420	18.6	412	19.9
7HP 7HVP	4"-S	0.367	1,170	359	6.0	344	8.0	314	12.0	297	14.0	288	15.0	278	16.0
			1,465	467	7.5	453	10.0	422	15.0	406	17.5	396	18.8	387	20.0
			1,760	575	9.0	561	12.0	531	18.1	514	21.1	505	22.6	495	24.1
			2,050	682	10.5	667	14.0	637	21.0	620	24.5	611	26.3	601	28.0
8HP 8HVP	4"-S	0.566	880	400	7.0	380	9.3	338	13.9	315	16.2	302	17.4		
			1,170	564	9.3	544	12.3	502	18.5	479	21.6	466	23.1	453	24.7
			1,375	680	10.9	660	14.5	618	21.7	595	25.4	582	27.2	569	29.0
			1,800	921	14.2	901	19.0	859	28.5	835	33.2	823	35.6	809	38.0

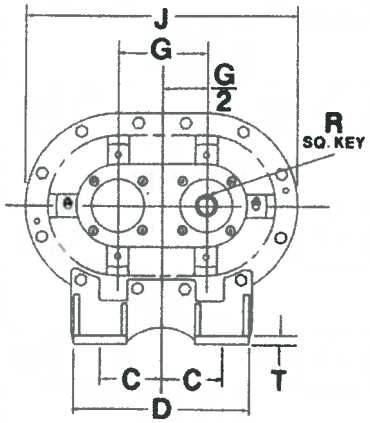
Sutorbilt Legend Dimensional Data

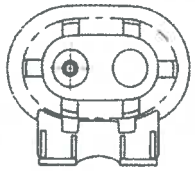
Horizontal Configurations

SIZE	WT.	CONN.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U
2M	72	S	5	2	2	6 3/8	3 1/4	3 3/4	2 3/4	7	9 1/4	1	5 5/32	10	2 3/4	1 15/16	1 11/16	3/16	.625	1/8	7/16
2L	86	S	7	3	2	6 3/8	3 1/4	3 3/4	2 3/4	7	9 1/4	2	6 5/32	12	4 3/4	1 15/16	1 11/16	3/16	.625	1/8	7/16
3H	88	S	6 3/4	2 11/16	2 7/8	7 3/4	3 7/8	5	3 1/2	8 7/8	11 1/4	1 1/4	5 11/16	11 7/8	3 1/2	2	1 11/16	1/16	.750	1/4	1/2 x 3/4
3M	110	S	7 5/8	3 1/8	2 7/8	7 3/4	3 7/8	5	3 1/2	8 7/8	11 1/4	2	6 1/4	12 3/4	4 1/8	2	1 11/16	1/16	.750	1/4	1/2 x 3/4
3L	132	S	10 1/4	4 7/16	2 7/8	7 3/4	3 7/8	5	3 1/2	8 7/8	11 1/4	2 1/2	7 9/16	15 1/8	7	2	1 11/16	1/16	.750	1/4	1/2 x 3/4
4H	138	S	7 1/4	3	3	8	4 3/16	6 1/4	4	10 7/16	12 3/8	1 1/2	6 7/8	13 3/4	4	2 3/8	2 1/8	3/16	.875	3/8	1/2 x 3/4
4M	160	S	9 1/2	4 1/8	3	8	4 3/16	6 1/4	4	10 7/16	12 3/8	2 1/2	8	16	6 3/4	2 3/8	2 1/8	1/4	.875	3/8	1/2 x 3/4
4L	182	S	12	5 3/8	3	8	4 3/16	6 1/4	4	10 7/16	12 3/8	3	9 1/4	18 1/2	8 3/4	2 3/8	2 1/8	3/16	.875	3/8	1/2 x 3/4
5H	210	S	8 1/2	3 1/2	3 1/2	9	5 1/16	7	5	12 1/16	15 1/8	2 1/2	8 1/16	17 1/16	4 7/8	2 1/2	2 1/4	1/4	1.125	1/8	5/16 x 3/4
5M	232	S	10 1/2	4 1/2	3 1/2	9	5 1/16	7	5	12 1/16	15 1/8	4	9 1/16	19 1/16	6 7/8	2 1/2	2 1/4	1/4	1.125	1/8	5/16 x 3/4
5L	306	S	14 1/2	6 1/2	3 1/2	9	5 1/16	7	5	12 1/16	15 1/8	4	11 1/16	23 1/16	10 7/8	2 1/2	2 1/4	1/4	1.125	1/8	5/16 x 3/4
6H	318	S	9 3/4	3 15/16	4	11	6	8 3/4	6	14 3/4	18	3	9 3/16	19 1/8	5 3/4	2 15/16	1 21/32	5/16	1.375	1/8	3/4 x 1
6M	366	S	13	5 9/16	4	11	6 3/16	8 3/4	6	15 15/16	18	5	10 13/16	22 3/8	9	2 15/16	1 21/32	5/16	1.375	1/8	3/4 x 1
6L	538	F	20	9 1/16	4	11	7 1/2	8 3/4	6	16 1/4	18	6	14 5/16	29 3/8	16	2 15/16	1 21/32	5/16	1.375	1/8	3/4 x 1
7H	482	S	12	4 5/8	5 1/2	15	9 11/16	11	7	20 11/16	22	4	10	21 1/8	5 3/4	3 1/16	2 1/8	3/8	1.562	1/2	3/4 x 1
7M	638	F	17 1/2	7 3/8	5 1/2	15	8 1/2	11	7	19 1/2	22	6	12 3/4	26 1/8	11 1/4	3 1/16	2 1/8	3/8	1.562	1/2	3/4 x 1
7L	770	F	24 1/2	10 7/8	5 1/2	15	8 1/2	11	7	19 1/2	22	8	16 1/4	33 1/8	18 1/4	3 1/16	2 1/8	3/8	1.562	1/2	3/4 x 1
8H	736	S	13 1/2	5 3/4	6	16	10	12 1/2	8	22 1/2	25 1/4	4	11 11/16	24	7 3/4	3 7/8	3 3/8	3/8	1.750	1/2	3/4 x 1
8M	938	F	19	8 1/2	6	16	10	12 1/2	8	22 1/2	25 1/4	8	14 7/16	29 1/2	13 1/4	3 7/8	3 3/8	3/8	1.750	1/2	3/4 x 1
8L	1,170	F	27	12 1/2	6	16	10	12 1/2	8	22 1/2	25 1/4	10	18 7/16	37 1/2	21 3/4	3 7/8	3 3/8	3/8	1.750	1/2	3/4 x 1

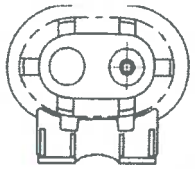
S=Threaded connections standard NPT. F=flange connections. Inlet and outlet connections are the same type and size.
Dimensions are in inches. Weights are in pounds and include shipping cartons or pallets.







LHC
LEFT HAND CENTRAL
(OPTIONAL ASSEMBLY)



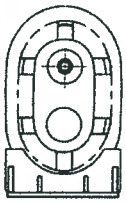
RHC
RIGHT HAND CENTRAL
(STANDARD ASSEMBLY)

CENTER TIMED FOR ROTATION
IN EITHER DIRECTION

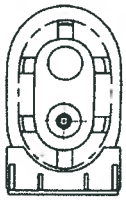
Vertical Configurations

SIZE	WT.	CONN.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U
2MV	72	S	5	2	1½	5⅝	3½	4⅞	6¼	9½	6½	1	5 3/32	10	2¾	1 15/16	1 11/16	3/16	.625	⅛	7/16
2LV	86	S	7	3	1½	5⅝	3½	4⅞	6¼	9½	6½	2	6 3/32	12	4¾	1 15/16	1 11/16	3/16	.625	⅛	7/16
3HV	88	S	6¾	2 11/16	2½	6¾	4½	6¼	8	11⅞	7¾	1¼	5 13/16	11⅞	3½	2	1 11/16	3/16	.750	¼	½ x ¾
3MV	110	S	7⅝	3 1/16	2½	6¾	4½	6¼	8	11⅞	7¾	2	6¼	12¾	4⅜	2	1 11/16	3/16	.750	¼	½ x ¾
3LV	132	S	10¼	4⅜	2½	6¾	4½	6¼	8	11⅞	7¾	2½	7 5/16	15⅜	7	2	1 11/16	3/16	.750	¼	½ x ¾
4HV	138	S	7¼	3	3	8	4½	6½	8½	12 11/16	8⅜	1½	6⅞	13¾	4	2⅜	2⅛	3/16	.875	⅛	½ x ¾
4MV	160	S	9½	4⅛	3	8	4½	6½	8½	12 11/16	8⅜	2½	8	16	6¼	2⅜	2⅛	3/16	.875	⅛	½ x ¾
4LV	182	S	12	5⅜	3	8	4½	6½	8½	12 11/16	8⅜	3	9¼	18½	8¾	2⅜	2⅛	3/16	.875	⅛	½ x ¾
5HV	210	S	8½	3½	3½	9	5½	8	10½	15 11/16	10⅜	2½	8 3/16	17 3/16	4⅞	2½	2¼	¼	1.125	⅜	5/16 x ¾
5MV	232	S	10½	4½	3½	9	5½	8	10½	15 11/16	10⅜	4	9 3/16	19 3/16	6⅞	2½	2¼	¼	1.125	⅜	5/16 x ¾
5LV	306	S	14½	6½	3½	9	5½	8	10½	15 11/16	10⅜	4	11 3/16	23 3/16	10⅞	2½	2¼	¼	1.125	⅜	5/16 x ¾
6HV	318	S	9¾	3 15/16	4	11	8¾	11¾	14¾	20¾	12	3	9 3/16	19⅛	5¾	2 15/16	1 21/32	5/16	1.375	⅜	¾ x 1
6MV	366	S	13	5 5/16	4	11	8¾	11¾	14¾	20¾	12⅜	5	10 13/16	22⅜	9	2 15/16	1 21/32	5/16	1.375	⅜	¾ x 1
6LV	538	F	20	9 1/16	4	11	8¾	11¾	14¾	20¾	15	6	14 5/16	29⅜	16	2 15/16	1 11/32	5/16	1.375	⅜	¾ x 1
7HV	482	S	12	4⅝	5½	14	11	14½	18	25½	19⅜	4	10	21⅛	5¾	3 1/16	2⅛	⅜	1.562	½	¾ x 1
7MV	638	F	17½	7⅜	5½	14	11	14½	18	25½	17	6	12¾	26⅛	11¼	3 1/16	2⅛	⅜	1.562	½	¾ x 1
7LV	770	F	24½	10⅞	5½	14	11	14½	18	25½	17	8	16¼	33⅛	18¼	3 1/16	2⅛	⅜	1.562	½	¾ x 1
8HV	736	S	13½	5¾	6	16	12½	16½	20½	29⅛	20	4	11 11/16	24	7¾	3⅞	3⅜	⅜	1.750	½	¾ x 1
8MV	938	F	19	8½	6	16	12½	16½	20½	29⅛	20	8	14 7/16	29½	13¼	3⅞	3⅜	⅜	1.750	½	¾ x 1
8LV	1,170	F	27	12½	6	16	12½	16½	20½	29⅛	20	10	18 7/16	37½	21¼	3⅞	3⅜	⅜	1.750	½	¾ x 1

S=Threaded connections standard NPT. F=flange connections. Inlet and outlet connections are the same type and size.
Dimensions are in inches. Weights are in pounds and include shipping cartons or pallets.

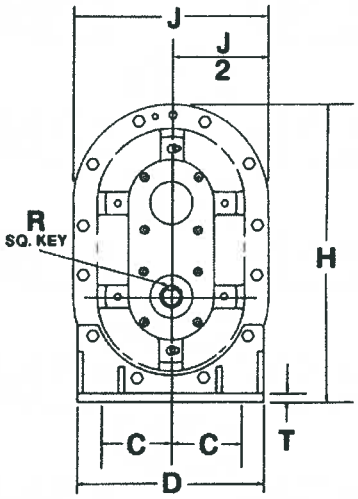


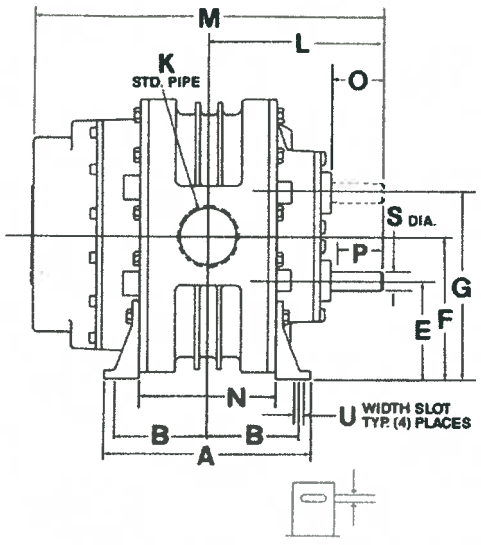
THC
TOP HAND CENTRAL
(OPTIONAL ASSEMBLY)



BHC
BOTTOM HAND CENTRAL
(STANDARD ASSEMBLY)

CENTER TIMED FOR ROTATION
IN EITHER DIRECTION





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Item # B1765-3X00, Single Feed Electro Lubricator, 1/2 gal Acrylic Reservoir, 5/8"-18 Thread for Remote Mounting, 1/8" Female NPT Outlet, 120V/60Hz

larger image

Single Feed Electro Lubricator, 1/2 gal Acrylic Reservoir, 5/8"-18 Thread for Remote Mounting, 1/8" Female NPT Outlet, 120V/60Hz
Single Feed Electro Lubricators are especially suitable for intermittent operations. Lubrication occurs when the solenoid is activated.

The reservoir and sight are vented to allow liquid to flow by gravity. An adjustable precision needle valve controls the flow rate; it has a friction lock to guard against loosening from vibration. Drop feeding can be observed through the glass viewing window in the valve body.

This electric oiler features a 1/8" female NPT outlet with a 5/8"-18 threaded shank for remote mounting. The solenoid has a ½" NPT thread for connecting with conduit and is powered by 120V/60Hz. For additional voltages and frequencies, please consult factory. The diameter of the reservoir is 5 1/2" and the total height of the lubricator is 12 1/16".

Specifications

Feature	Remote Mounting 5/8"-18 Thread
Outlet	1/8" Female NPT
Reservoir Type	Acrylic
Capacity	1/2 gal
Voltage	120V/60Hz

Print Back

WGI

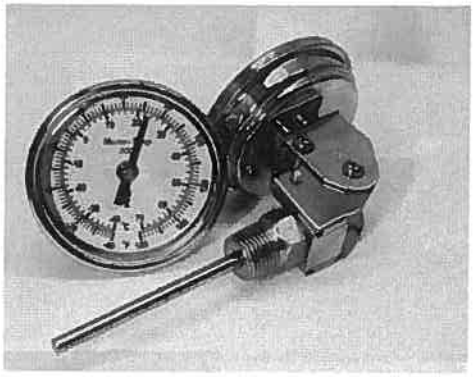
Temperature Gauges

Industrial Service Temperature Gauges

Stainless Steel Case
304 Stainless Steel Internals
Master-Temp • Model 300
3" Dial

Application

WGI Bimetal Thermometers are rugged and are preferred by the process, offshore, pharmaceutical, power and chemical industries. Liquid filling for additional dampening, extreme vibration, or to ensure consistent performance in low temperature or high humidity applications.



Standard Features

Dial
3" Dial

Case
304 stainless steel

Lens (Window) Material
Glass

Stem
White aluminum with black and red lettering

Pointer
Black aluminum

Accuracy
± 1% full scale

Ambient Temperature
75% of full scale value (recommended max)

Operating Temperature
-60°C to 120°C (-76°F to 248°F)

Enclosure Rating
IP68

Case Material
304 Stainless Steel

Recalibration
Recalibration screw on back of case (standard)

Optional Features (minimum order may apply)

Silicone fill

Single scale(s) (C° only F° only)

Custom stem lengths up to 72"

Private label (your logo on dial)

Custom temperature ranges available

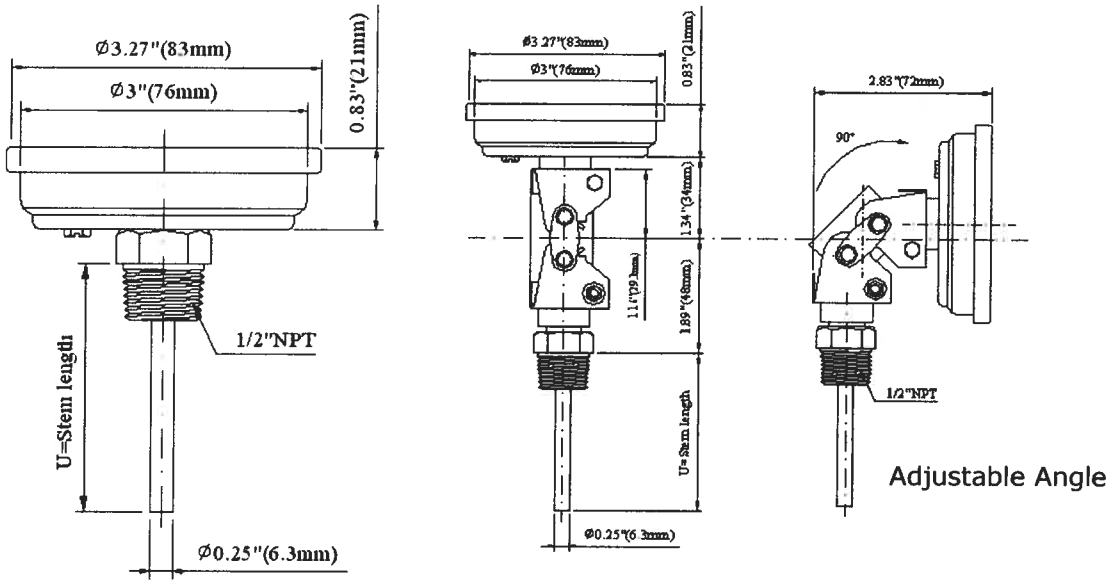
Optional mounting styles available (ie side mount)

Spiked stem tips

Dial Size	3" Dial						
Connection	1/2" NPT Center Back Mount						
Stem Length	2½"	4"	6"	9"	12"	15"	18"
Range							
-40°F to 160°F (-40C to 70°C)	WL31102	WL31202	WL31302	WL31402	WL31502	WL31602	WL31702
0°F to 250°F (-20°C to 120°C)	WL31105	WL31205	WL31305	WL31405	WL31505	WL31605	WL31705
50°F to 300°F (10°C to 150°C)	WL31106	WL31206	WL31306	WL31406	WL31506	WL31606	WL31706
50°F to 500°F (10°C to 260°C)	WL31108	WL31208	WL31308	WL31408	WL31508	WL31608	WL31708
150° to 750°F (50°C to 400°C)	WL31110	WL31210	WL31310	WL31410	WL31510	WL31610	WL31710
200° to 1000°F (100° to 550°C)	WL31111	WL31211	WL31311	WL31411	WL31511	WL31611	WL31711

Dial Size	3" Dial						
Connection	1/2" NPT Center Back Mount Adjustable Angle						
Stem Length	2½"	4"	6"	9"	12"	15"	18"
Range							
-40°F to 160°F (-40C to 70°C)	WL33102	WL33202	WL33302	WL33402	WL33502	POR	POR
0°F to 250°F (-20°C to 120°C)	WL33105	WL33205	WL33305	WL33405	WL33505	POR	POR
50°F to 300°F (10°C to 150°C)	WL33106	WL33206	WL33306	WL33406	WL33506	POR	POR
50°F to 500°F (10°C to 260°C)	WL33108	WL33208	WL33308	WL33408	WL33508	POR	POR
150° to 750°F (50°C to 400°C)	WL33110	WL33210	WL33310	WL33410	WL33510	POR	POR
200° to 1000°F (100° to 550°C)	WL33111	WL33211	WL33311	WL33411	WL33511	POR	POR

Temperature Range	Major Divisions		Minor Divisions	
	°F	°C	°F	°C
-40°F to 160°F (-40C to 70°C)	10	10	2	2
0°F to 250°F (-20°C to 120°C)	10	10	2	2
50°F to 300°F (10°C to 150°C)	10	10	2	2
50°F to 500°F (10°C to 260°C)	25	10	5	5
150° to 750°F (50°C to 400°C)	50	10	10	5
200° to 1000°F (100° to 550°C)	50	10	10	5



Series	Dial Size	A	B	C	D (Hex)	E
WL31000	2"	2.13"	0.425"	1/4" NPT	0.546"	n/a
WL33000	2"	2.13"	0.425"	1/2" NPT	0.822"	n/a

Western Gauge & Instruments Ltd. – Head Office
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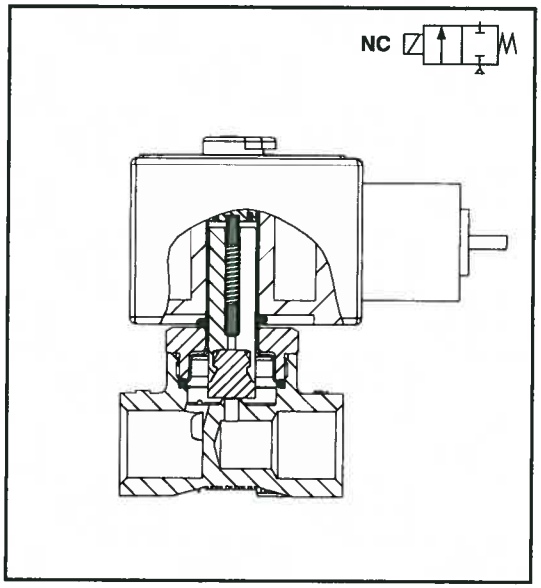
Western Gauge & Instruments Ltd. – Branch Office
6624 – 50th Street
Edmonton, AB T6B 2N7
Ph: (780) 463-3800 Fax: (780) 463-3990
Email: edm@wgiltd.com

Features

- Welded core tube provides higher pressure ratings
- Reliable, proven design with high flows
- Small poppet valves for tight shutoff
- Wide range of elastomers for specialty service applications
- Mountable in any position
- Tapped mounting holes in body standard



Construction

Valve Parts In Contact with Fluids		
Body	Brass	Cast 304 Stainless Steel
Seals and Discs	NBR or Cast UR	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

Electrical

Watt Rating and Power Consumption				Spare Coil Part No.			
	AC			General Purpose		Explosionproof	
DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
10.6	6.1*	16	30	238210	238510	238214	238514
18.6	9.1*	20	45	238210	238510	238214	238514
11.6	10.1	25	50	238610	238910	238614	238914
22.6	17.1	40	70	238610	238910	238614	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

*On 50 hertz service, the rating for the 6.1/F solenoid is 8.1 watts, and the rating for the 9.1/F solenoid is 11.1 watts.

Solenoid Enclosures

Standard: Watertight, Types 1, 2, 3, 3S, 4, and 4X.

Optional: Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9. (To order, add prefix "EF" to catalog number)

See Optional Features Section for other available options.

Options

Mounting bracket (suffix MB)
Quarter-turn manual operator with screw slot (suffix MS)
Panel mount (prefix GP for conduit; *consult ASCO for other electrical connections*)
Vacuum service (suffix VVM, VVH; *see Vacuum Section for more details.*)
Oxygen service (suffix N)
Silicone Free (suffix SF)

Elastomers: FKM (suffix V), Ethylene Propylene (suffix E), CR (suffix J), Teflon (suffix T), Low Temp NBR (suffix A)

Note: For suffix A, Fluid temp. range -40°F to 167°F only for valves with 10.1, 17.1, 11.6, and 22.6 watt coils.

Refer to Engineering Section for fluid and temperature compatibility.

Nominal Ambient Temp. Ranges

The nominal limitation of 32°F (0°C) is advisable for any valve that might contain moisture (water vapor).

AC: -13°F to 131°F (-25°C to 55°C)

DC: -13°F to 104°F (-25°C to 40°C)
-13°F to 131°F (-25°C to 55°C)

Note: Max ambient for explosionproof (EF) is 125°F (52°C) for AC, 131°F (55°C) for DC.

Optional: For AC, the max. ambient temperature is 140°F (60°C) with Class H coil (with or without prefix EF)

Refer to Engineering Section for details.

Approvals

CSA certified. UL listed, as indicated. Safety Shutoff Valves FM approved. Meets applicable CE directives.

Refer to Engineering Section for details.

2/2 SERIES 8262 8263

ASCO®

Specifications (English units)

Pipe Size (in)	Orifice size (in)	Cv Flow Factor	Operating Pressure Differential (psi)									Max. Fluid Temp. °F		Catalog Number		Const. Ref.	UL Listing	Watt Rating/ Class of Coil Insulation	
			Max. AC@131°F			Max. DC@104°F			Max. DC@131°F										
			Air-Inert Gas	Water	Lt. Oil @ 300ssu	Air-Inert Gas	Water	Lt. Oil @ 300ssu	Air-Inert Gas	Water	Lt. Oil 300ssu	AC	DC	Brass	Stainless Steel			AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR Disc																			
1/8	3/64	0.06	2200	2200	1700	-	-	-	-	-	-	140	-	-	8262H175 ①	1	●	10.1/F	-
1/8	3/64	0.06	-	-	-	2000	2000	1725	1900	1900	1700	-	140	-	8262H176 ①	1	●	-	22.6/H
1/8	3/64	0.06	-	-	-	1500	1500	1500	1500	1500	1500	-	140	8262H089 ①	-	1	●	-	22.6/H
1/8	3/64	0.06	2025	1710	825	965	745	720	920	700	675	140	140	-	8262H079 ①	2	●	9.1/F	18.6/H
1/8	3/64	0.06	1500	1350	825	750	620	565	700	565	530	140	140	8262H096 ①	-	2	●	6.1/F	10.6/H
1/8	3/64	0.06	1500	1350	825	-	-	-	-	-	-	140	-	-	8262H173 ①	2	●	6.1/F	-
1/8	3/64	0.06	1500	1500	1500	1170	1145	945	1000	965	855	140	140	8262H099 ①	-	1	●	10.1/F	11.6/H
1/8	3/64	0.06	750	750	725	750	640	550	750	600	500	180	180	8262H001	8262H012	2	○	6.1/F	10.6/H
1/8	3/32	0.21	720	410	410	610	410	410	600	410	400	180	180	8262H277	8262H178	1	○	17.1/F	22.6/H
1/8	3/32	0.21	-	-	-	290	290	270	240	240	255	180	180	-	8262H177	1	○	-	11.6/H
1/8	3/32	0.21	500	350	325	295	210	205	285	200	195	180	180	8262H011	-	2	○	9.1/F	18.6/H
1/8	3/32	0.21	370	330	190	235	160	160	215	150	145	180	180	8262H014	8262H015	2	○	6.1/F	10.6/H
1/8	1/8	0.35	500	380	355	275	275	235	250	250	225	180	180	8262H105	8262H174	1	○	17.1/F	22.6/H
1/8	1/8	0.35	340	300	215	-	-	-	-	-	-	-	180	-	8262H179	1	○	10.1/F	-
1/8	1/8	0.35	275	260	195	165	130	130	155	120	120	180	180	8262H016	-	2	○	9.1/F	18.6/H
1/8	1/8	0.35	185	180	120	130	110	95	120	100	90	180	180	8262H002	8262H006	2	○	6.1/F	10.6/H
1/4	3/64	0.06	2200	2200	1700	1170	1145	945	1000	965	855	140	140	-	8262H214 ①	3	●	10.1/F	11.6/H
1/4	3/64	0.06	1500	1500	1500	1170	1145	945	1000	965	855	140	140	8262H200 ①	-	3	●	10.1/F	11.6/H
1/4	3/64	0.06	1500	1500	1500	1500	1500	1500	1500	1500	1500	140	140	8262H107 ①	-	3	●	17.1/F	22.6/H
1/4	3/64	0.06	-	-	-	2000	2000	1725	1900	1900	1700	-	140	-	8262H181 ①	3	●	-	22.6/H
1/4	3/64	0.06	1500	1350	825	750	620	530	700	565	495	140	140	8262H106 ①	8262H180 ①	4	●	6.1/F	10.6/H
1/4	3/64	0.06	750	750	725	750	640	550	750	600	500	180	180	8262H019	8262H080	4	○	6.1/F	10.6/H
1/4	3/32	0.21	720	410	410	610	410	410	600	410	400	180	180	8262H109	8262H183	3	○	17.1/F	22.6/H
1/4	3/32	0.21	590	410	410	290	290	270	240	240	225	180	180	8262H108	8262H182	3	○	10.1/F	11.6/H
1/4	3/32	0.21	500	350	270	295	210	205	285	200	195	180	180	8262H021	-	4	○	9.1/F	18.6/H
1/4	3/32	0.21	370	330	160	235	160	160	215	150	145	180	180	8262H020	8262H086	4	○	6.1/F	10.6/H
1/4	1/8	0.35	500	380	355	275	275	235	250	250	225	180	180	8262H110	8262H185	3	○	17.1/F	22.6/H
1/4	1/8	0.35	340	300	215	130	125	115	110	105	100	180	180	8262H232	-	3	○	10.1/F	11.6/H
1/4	1/8	0.35	340	300	215	-	-	-	-	-	-	180	-	-	8262H184	3	○	10.1/F	-
1/4	1/8	0.35	275	260	150	165	130	120	155	120	115	180	180	8262H023	-	4	○	9.1/F	18.6/H
1/4	1/8	0.35	185	180	90	130	110	90	120	100	85	180	180	8262H022	8262H007	4	○	6.1/F	10.6/H
1/4	5/32	0.52	300	210	210	135	135	135	115	115	115	180	180	8262H112	8262H187	3	○	17.1/F	22.6/H
1/4	5/32	0.52	210	200	145	65	63	63	55	54	54	180	180	8262H202	-	3	○	10.1/F	11.6/H
1/4	5/32	0.52	210	200	145	-	-	-	-	-	-	180	180	-	8262H220	3	○	10.1/F	-
1/4	5/32	0.52	150	140	100	95	75	75	85	72	70	180	180	8262H113	-	4	○	9.1/F	18.6/H
1/4	5/32	0.52	100	100	55	72	60	55	67	53	52	180	180	8262H111	8262H186	4	○	6.1/F	10.6/H
1/4	7/32	0.73	125	125	125	70	70	70	65	65	65	180	180	8262H114	8262H188	3	○	17.1/F	22.6/H
1/4	7/32	0.73	100	100	100	35	35	35	30	30	30	180	180	8262H208	-	3	○	10.1/F	11.6/H
1/4	7/32	0.73	100	100	100	-	-	-	-	-	-	180	-	-	8262H226	3	○	10.1/F	-
1/4	7/32	0.73	55	54	40	38	33	31	35	30	28	180	180	8262H013	8262H036	4	○	6.1/F	10.6/H
1/4	9/32	0.88	90	90	90	53	50	47	48	46	44	180	180	8262H212	8262H230	3	○	17.1/F	22.6/H
1/4	9/32	0.88	65	75	60	25	25	22	22	22	20	180	180	8262H210	-	3	○	10.1/F	11.6/H
1/4	9/32	0.88	65	75	60	-	-	-	-	-	-	180	-	-	8262H189	3	○	10.1/F	-
1/4	9/32	0.88	36	36	33	27	23	21	24	22	20	180	180	8262H090	8262H038	4	○	6.1/F	10.6/H
3/8	1/8	0.35	500	380	355	275	275	160	250	250	150	180	180	8263H115	8263H191	5	○	17.1/F	22.6/H
3/8	1/8	0.35	340	300	215	130	125	85	110	105	75	180	180	8263H232	-	5	○	10.1/F	11.6/H
3/8	1/8	0.35	340	300	215	-	-	-	-	-	-	180	-	-	8263H190	5	○	10.1/F	-
3/8	1/8	0.35	275	260	140	165	130	110	155	120	105	180	180	8263H003	-	6	○	9.1/F	18.6/H
3/8	1/8	0.35	185	180	90	130	110	80	120	100	75	180	180	8263H002	8263H330	6	○	6.1/F	10.6/H
3/8	5/32	0.52	300	210	195	135	135	100	115	115	90	180	180	8263H118	8263H193	5	○	17.1/F	22.6/H
3/8	5/32	0.52	210	185	100	65	63	50	55	54	44	180	180	8263H200	-	5	○	10.1/F	11.6/H
3/8	5/32	0.52	210	185	100	-	-	-	-	-	-	180	-	-	8263H331	5	○	10.1/F	-
3/8	5/32	0.52	150	140	80	95	75	75	85	72	70	180	180	8263H117	-	6	○	9.1/F	18.6/H
3/8	5/32	0.52	100	100	50	72	60	55	67	53	52	180	180	8263H116	8263H192	6	○	6.1/F	10.6/H
3/8	7/32	0.73	125	100	100	70	70	70	65	65	65	180	180	8263H206	8263H332	5	○	17.1/F	22.6/H
3/8	7/32	0.73	100	86	70	35	35	35	30	30	30	180	180	8263H124	-	5	○	10.1/F	11.6/H
3/8	7/32	0.73	100	86	70	-	-	-	-	-	-	180	-	-	8263H195	5	○	10.1/F	-
3/8	7/32	0.73	55	54	29	38	33	31	35	30	28	180	180	8263H119	8263H194	6	○	6.1/F	10.6/H
3/8	9/32	0.88	100	85	70	53	50	47	48	46	44	180	180	8263H210	8263H333	5	○	17.1/F	22.6/H
3/8	9/32	0.88	65	63	47	-	-	-	-	-	-	180	180	8263H125	8263H197	5	○	10.1/F	-
3/8	9/32	0.88	35	32	21	27	23	21	24	22	20	180	180	8263H054	8263H196	6	○	6.1/F	10.6/H

 ① Only available with UR disc, limits min. ambient temp. to 32°F (0°C); ● = General Purpose Valve, ○ = Safety Shutoff Valve

Specifications (Metric units)

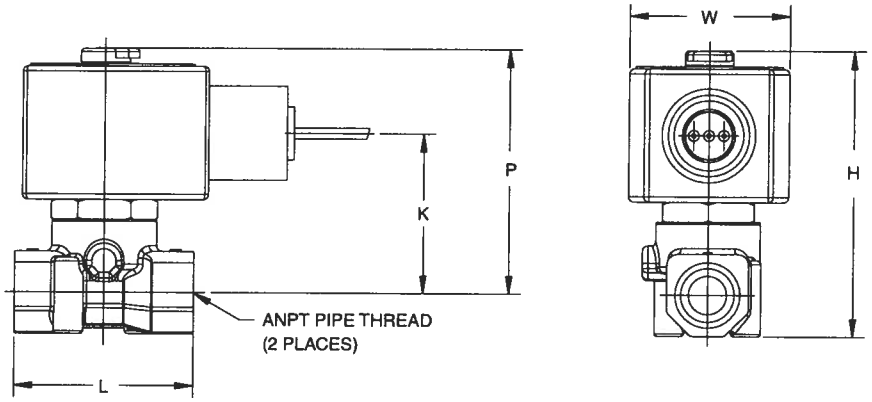
Pipe Size (in)	Orifice size (mm)	Kv Flow Factor (m^3/h)	Operating Pressure Differential (bar)									Max. Fluid Temp. °C		Catalog Number		Const. Ref.	UL Listing	Watt Rating/ Class of Coil Insulation	
			Max. AC@55°C			Max. DC@40°C			Max. DC@55°C										
			Air-inert Gas	Water	Lt. Oil @ 300ssu	Air-inert Gas	Water	Lt. Oil @ 300ssu	Air-inert Gas	Water	Lt. Oil 300ssu	AC	DC	Brass	Stainless Steel			AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR Disc																			
1/8	1.2	0.05	152	152	117	-	-	-	-	-	-	60	-	-	8262H175 ①	1	●	10.1/F	-
1/8	1.2	0.05	-	-	-	138	138	119	131	131	117	-	60	-	8262H176 ①	1	●	-	22.6/H
1/8	1.2	0.05	-	-	-	103	103	103	103	103	103	-	60	8262H089 ①	-	1	●	-	22.6/H
1/8	1.2	0.05	140	118	57	67	51	50	63	48	47	60	60	-	8262H079 ①	2	●	9.1/F	18.6/H
1/8	1.2	0.05	103	93	57	52	43	39	48	39	37	60	60	8262H096 ①	-	2	●	6.1/F	10.6/H
1/8	1.2	0.05	103	93	57	-	-	-	-	-	-	60	-	-	8262H173 ①	2	●	6.1/F	-
1/8	1.2	0.05	103	103	103	81	79	65	69	67	59	60	60	8262H099 ①	-	1	●	10.1/F	11.6/H
1/8	1.2	0.05	52	52	50	52	44	38	52	41	34	82	82	8262H001	8262H012	2	○	6.1/F	10.6/H
1/8	2.4	0.18	50	28	28	42	28	28	41	28	28	82	82	8262H277	8262H178	1	○	17.1/F	22.6/H
1/8	2.4	0.18	-	-	-	20	20	19	17	17	18	-	82	-	8262H177	1	○	-	11.6/H
1/8	2.4	0.18	34	24	22	20	14	14	20	14	13	82	82	8262H011	-	2	○	9.1/F	18.6/H
1/8	2.4	0.18	26	23	13	16	11	11	15	10	10	82	82	8262H014	8262H015	2	○	6.1/F	10.6/H
1/8	3.2	0.30	34	26	24	19	19	16	17	17	16	82	82	8262H105	8262H174	1	○	17.1/F	22.6/H
1/8	3.2	0.30	23	21	15	-	-	-	-	-	-	82	-	-	8262H179	1	○	10.1/F	-
1/8	3.2	0.30	19	18	13	11	9	9	11	8	8	82	82	8262H016	-	2	○	9.1/F	18.6/H
1/8	3.2	0.30	13	12	8	9	8	7	8	7	6	82	82	8262H002	8262H006	2	○	6.1/F	10.6/H
1/4	1.2	0.05	152	152	117	81	79	65	69	67	59	60	60	-	8262H214 ①	3	●	10.1/F	11.6/H
1/4	1.2	0.05	103	103	103	81	79	65	69	67	59	60	60	8262H200 ①	-	3	●	10.1/F	11.6/H
1/4	1.2	0.05	103	103	103	103	103	103	103	103	103	60	60	8262H107 ①	-	3	●	17.1/F	22.6/H
1/4	1.2	0.05	-	-	-	138	138	119	131	131	117	-	60	-	8262H181 ①	3	●	-	22.6/H
1/4	1.2	0.05	103	93	57	52	43	37	48	39	34	60	60	8262H106 ①	8262H180 ①	4	●	6.1/F	10.6/H
1/4	1.2	0.05	52	52	50	52	44	38	52	41	34	82	82	8262H019	8262H080	4	○	6.1/F	10.6/H
1/4	2.4	0.18	50	28	28	42	28	28	41	28	28	82	82	8262H109	8262H183	3	○	17.1/F	22.6/H
1/4	2.4	0.18	41	28	28	20	20	19	17	17	16	82	82	8262H108	8262H182	3	○	10.1/F	11.6/H
1/4	2.4	0.18	34	24	19	20	14	14	20	14	13	82	82	8262H021	-	4	○	9.1/F	18.6/H
1/4	2.4	0.18	26	23	11	16	11	11	15	10	10	82	82	8262H020	8262H086	4	○	6.1/F	10.6/H
1/4	3.2	0.30	34	26	24	19	19	16	17	17	16	82	82	8262H110	8262H185	3	○	17.1/F	22.6/H
1/4	3.2	0.30	23	21	15	9	9	8	8	7	7	82	82	8262H232	-	3	○	10.1/F	11.6/H
1/4	3.2	0.30	23	21	15	-	-	-	-	-	-	82	-	-	8262H184	3	○	10.1/F	-
1/4	3.2	0.30	19	18	10	11	9	8	11	8	8	82	82	8262H023	-	4	○	9.1/F	18.6/H
1/4	3.2	0.30	13	12	6	9	8	6	8	7	6	82	82	8262H022	8262H007	4	○	6.1/F	10.6/H
1/4	4.0	0.45	21	14	14	9	9	9	8	8	8	82	82	8262H112	8262H187	3	○	17.1/F	22.6/H
1/4	4.0	0.45	14	14	10	4	4	4	4	4	4	82	82	8262H202	-	3	○	10.1/F	11.6/H
1/4	4.0	0.45	14	14	10	-	-	-	-	-	-	82	-	-	8262H220	3	○	10.1/F	-
1/4	4.0	0.45	10	10	7	7	5	5	6	5	5	82	82	8262H113	-	4	○	9.1/F	18.6/H
1/4	4.0	0.45	7	7	4	5	4	4	5	4	4	82	82	8262H111	8262H186	4	○	6.1/F	10.6/H
1/4	5.6	0.63	9	9	9	5	5	5	4	4	4	82	82	8262H114	8262H188	3	○	17.1/F	22.6/H
1/4	5.6	0.63	7	7	7	2	2	2	2	2	2	82	82	8262H208	-	3	○	10.1/F	11.6/H
1/4	5.6	0.63	7	7	7	-	-	-	-	-	-	82	-	-	8262H226	3	○	10.1/F	-
1/4	5.6	0.63	4	4	3	3	2	2	2	2	2	82	82	8262H013	8262H036	4	○	6.1/F	10.6/H
1/4	7.1	0.76	6	6	6	4	3	3	3	3	3	82	82	8262H212	8262H230	3	○	17.1/F	22.6/H
1/4	7.1	0.76	4	5	4	2	2	2	2	2	1	82	82	8262H210	-	3	○	10.1/F	11.6/H
1/4	7.1	0.76	4	5	4	-	-	-	-	-	-	82	-	-	8262H189	3	○	10.1/F	-
1/4	7.1	0.76	2	2	2	2	2	1	2	2	1	82	82	8262H090	8262H038	4	○	6.1/F	10.6/H
3/8	3.2	0.30	34	26	24	19	21	11	17	19	10	82	82	8263H115	8263H191	5	○	17.1/F	22.6/H
3/8	3.2	0.30	23	21	15	9	9	6	8	7	5	82	82	8263H232	-	5	○	10.1/F	11.6/H
3/8	3.2	0.30	23	21	15	-	-	-	-	-	-	82	82	-	8263H190	5	○	10.1/F	-
3/8	3.2	0.30	19	18	10	11	9	8	11	8	7	82	82	8263H003	-	6	○	9.1/F	18.6/H
3/8	3.2	0.30	13	12	6	9	8	6	8	7	5	82	82	8263H002	8263H330	6	○	6.1/F	10.6/H
3/8	4.0	0.45	21	14	13	9	9	7	8	8	6	82	82	8263H118	8263H193	5	○	17.1/F	22.6/H
3/8	4.0	0.45	14	13	7	4	4	3	4	4	3	82	82	8263H200	-	5	○	10.1/F	11.6/H
3/8	4.0	0.45	14	13	7	-	-	-	-	-	-	82	-	-	8263H331	5	○	10.1/F	-
3/8	4.0	0.45	10	10	6	7	5	5	6	5	5	82	82	8263H117	-	6	○	9.1/F	18.6/H
3/8	4.0	0.45	7	7	3	5	4	4	5	4	4	82	82	8263H116	8263H192	6	○	6.1/F	10.6/H
3/8	5.6	0.63	9	7	7	5	5	5	4	4	4	82	82	8263H206	8263H332	5	○	17.1/F	22.6/H
3/8	5.6	0.63	7	6	5	2	2	2	2	2	2	82	82	8263H124	-	5	○	10.1/F	11.6/H
3/8	5.6	0.63	7	6	5	-	-	-	-	-	-	82	-	-	8263H195	5	○	10.1/F	-
3/8	5.6	0.63	4	4	2	3	2	2	2	2	2	82	82	8263H119	8263H194	6	○	6.1/F	10.6/H
3/8	7.1	0.76	7	6	5	4	3	3	3	3	3	82	82	8263H210	8263H333	5	○	17.1/F	22.6/H
3/8	7.1	0.76	4	4	3	-	-	-	-	-	-	82	-	8263H125	8263H197	5	○	10.1/F	-
3/8	7.1	0.76	2	2	1	2	2	1	2	2	1	82	82	8263H054	8263H196	6	○	6.1/F	10.6/H

① Only available with UR disc, limits min. ambient temp. to 32°F (0°C); ● = General Purpose Valve, ○ = Safety Shutoff Valve

Dimensions: inches (mm)

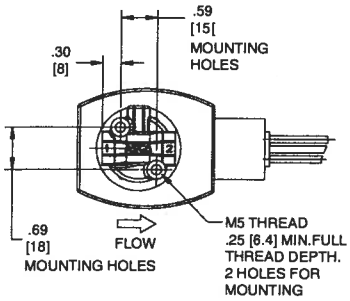
Const. Ref.		H	K	L	P	W
1	ins	3.05	1.71	1.19	2.69	1.95
	mm	77	43	30	68	50
2	ins	2.85	1.60	1.19	2.50	1.69
	mm	72	41	30	63	43
3	ins	3.12	1.79	1.56	2.76	1.95
	mm	79	45	40	70	50
4	ins	2.96	1.72	1.56	2.60	1.69
	mm	75	44	40	66	43
5	ins	3.20	1.79	1.88	2.77	1.95
	mm	81	45	48	70	50
6	ins	3.03	1.72	1.88	2.60	1.69
	mm	77	44	48	66	43

Const. Ref. 1-6

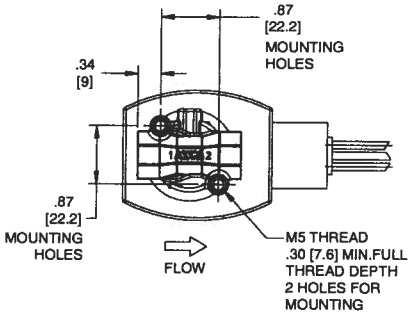


Mounting Dimensions

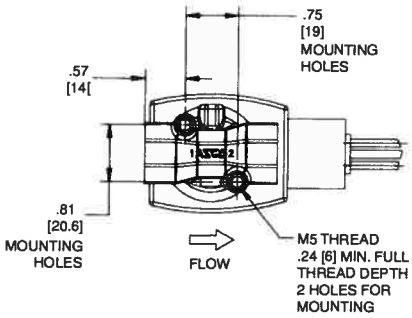
Const. Ref. 1, 2
(1/8" Pipe)



Const. Ref. 3, 4
(1/4" Pipe)



Const. Ref. 5, 6
(3/8" Pipe)



Note: Mounting holes will accept a standard #10-32 machine screw.

KUNKLE

Model 215V is Non-code Vacuum Relief. Model 337 is ASME Section VIII Air/Gas "UV" National Board Certified Safety Valve. Both are PED Certified for Non-Hazardous Gas.

Features

- Large nozzle design provides high capacity.
- Flat bronze valve seats are lapped for optimum performance.
- Warn ring offers easy adjustability for precise opening with minimum pre-open or simmer.
- Pivot between disc and spring corrects misalignment and compensates for spring side thrust.
- Each Kunkle valve is tested and inspected for pressure setting and leakage.

Model Descriptions

- **Model 337:** has "lift-pin" lift device for easy manual testing.
- All adjustments are factory sealed to help prevent tampering or disassembly.

Option

- Stainless Steel (SS) trim. (nozzle and disc) (variation 03)

Applications

- Protection of low to medium pressure high volume blowers, compressors and pneumatic conveying systems.
- Bulk hauling trailers/equipment.
- Light gauge tanks.
- Protection of high volume vacuum pumps and conveying systems.

Vacuum Limits

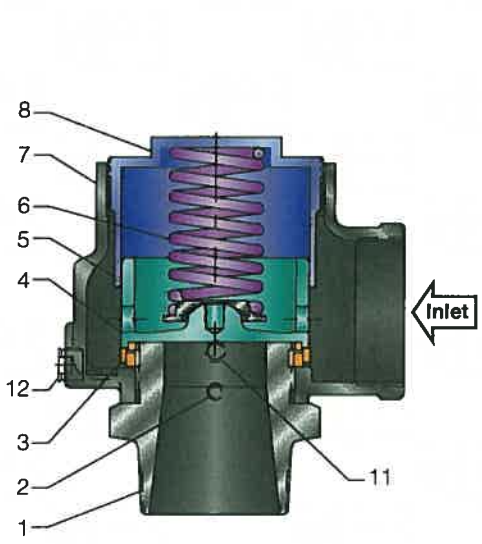
Model 215V:
2" Hg to 29" Hg [67.7 to 982 mbarg]
-20° to 406°F [-29° to 208°C]

Pressure and Temperature Limits

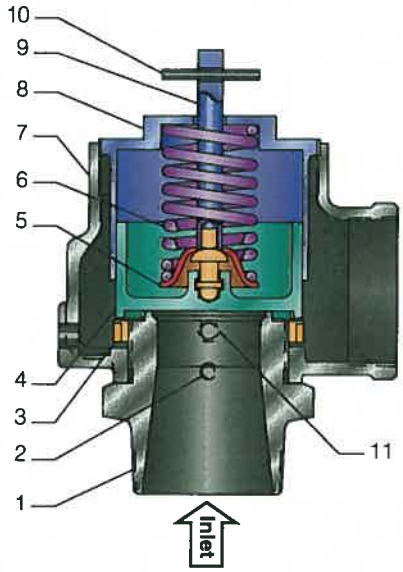
Model 337:
1 to 60 psig [0.07 to 4.1 barg]
-20° to 406°F [-29° to 208°C]

tyco Flow Control

Parts and Materials



Model 215V



Model 337

Models 215V and 337

No.	Part Name	215V	337
1	Nozzle[1]	Bronze, SB62 or Brass B283-C48500	Bronze, SB62 or Brass B283-C48500
2	Set Screw	Steel A108-1018 Brass Plated	Steel A108-1018 Brass Plated
3	Regulator Ring	Bronze B584 Alloy 84400	Bronze B584-C84400
4	Disc[1]	Bronze B584 Alloy 84400	Bronze B584-C84400
5	Spring Step	Steel A-109 Coated[3]	Steel A109 Coated[3]
6	Spring	SS, A313 TY 302	SS A313-302
7	Body	Cast Iron A-126, CL A or B	Iron A-126, CL A or B
8	Compression Screw	Bronze, B-584 Alloy 84400	Bronze, B584-C84400
9	Stem[2]	N/A	Brass B16
10	Lift Pin[2]	N/A	Steel, Zinc Plated
11	Regulator Ring Set Screw	N/A	Brass B16
12	NPT Drainplug	Steel A108-1018	N/A

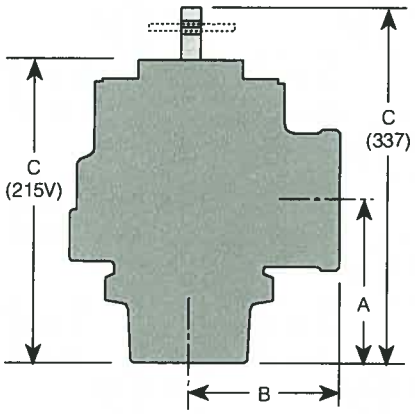
Notes

1. Disc and nozzle available in SSA-479 TY 316.
2. Stem and lift pin available on Model 337 only.
3. Corrosion preventative coating.

Specifications

Size Inlet and Outlet	Dimensions, in [mm] A	B	C 215V	C 337	Weight lb [kg]
2" [50.8 mm]	3 1/4 [82.5]	3 [76.2]	6 1/2 [165.1]	7 [177.8]	8 [3.6]
2 1/2" [63.5 mm]	3 3/4 [95.2]	3 1/2 [88.9]	7 5/8 [194.6]	8 [203.2]	12 [5.4]
3" [76.2 mm]	4 1/4 [107.9]	4 [101.6]	8 1/2 [215.9]	9 [228.6]	20 [9.07]

Dimensions are for reference only.



Model 337

Capacities

Model 337, Non-code[1] and ASME Section VIII Air (SCFM)

Set Pressure (psig)	Valve Inlet and Outlet Size 2" Orifice Area, in² 1.84	2 1/2" Orifice Area, in² 2.79	3" Orifice Area, in² 4.04
1	240	364	527
5	531	805	1166
10	741	1124	1628
15	948	1436	2081
20	1092	1656	2399
25	1237	1875	2718
30	1382	2095	3036
35	1542	2337	3386
40	1701	2578	3736
45	1860	2820	4086
50	2020	3061	4436
55	2179	3303	4786
60	2338	3544	5136

Note

1. No code stamp or "NB" on nameplate below 15 psig set.

Model 337, Non-code[1] and ASME Section VIII Air [Metric, Nm³/h]

Set Pressure [barg]	Valve Inlet and Outlet Size 50 mm	63 mm	80 mm
0.5	1049	1589	2303
1.0	1457	2208	3200
1.5	1888	2861	4147
2.0	2235	3387	4910
2.5	2613	3959	5739
3.0	2995	4538	6579
3.5	3377	5117	7418
4.0	3760	5696	8258

Note

1. No code stamp or "NB" on nameplate below 1.1 barg set.

Model 215V, Non-code Vacuum Air (SCFM)

Relief Set (in, HG)	Valve Inlet and Outlet Size 2" Orifice Area, in² 1.84	2 1/2" Orifice Area, in² 2.79	3" Orifice Area, in² 4.04
2	229	347	503
5	338	512	742
10	415	630	912
15	426	646	936
20	426	646	936
29	426	646	936

Note

1. Based on 10% accumulation.

Model 215V, Non-code Vacuum Air [Metric, Nm³/h]

Relief Set [mbarg]	Valve Inlet and Outlet Size 5.08 cm Orifice Area [11.86 cm²]	6.35 cm Orifice Area [17.97 cm²]	7.62 cm Orifice Area [26.05 cm²]
50	328	498	722
100	450	682	988
150	533	807	1170
200	593	899	1303
250	638	966	1400
300	669	1014	1470
350	690	1046	1516
400	701	1062	1540
450	704	1067	1546
500	704	1067	1546
550	704	1067	1546
600	704	1067	1546
650	704	1067	1546
700	704	1067	1546
750	704	1067	1546

Note

1. Based on 10% accumulation.

Model Number/Order Guide

Model Number Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Example	2	1	5	V	—	H	0	1	A	Q	E	0	0	5	0

Model
215V
0337

Inlet Size
H - 2" [50.8 mm]
J - 2½" [63.5 mm]
K - 3" [76.2 mm]

Variation (01 to 99)
01 - Bronze Disc and Nozzle
03 - SS Disc and Nozzle
60 - BSP Connections

Design Revision
Indicates non-interchangeable revision.
Current Design is at Revision "A."

Valve Service
K - Air ASME Section VIII (Model 337 only)
Q - Vacuum (Model 215V only)
N - Non-code Air/Gas (Model 337 only)

Spring Material
E - SST Type 302
(H-Orifice up to 8 psi; J-Orifice up to 20 psi; K-Orifice up to 25 psi)
M - SST Type 17-7
(H-Orifice above 8 psi; J-Orifice above 20 psi; K-Orifice above 25 psi)

Set Pressure
Model 337, 1 psig [0.7 barg] (0001) to 60 psig [4.1 barg] (0060)
Model 215V, 2" Hg [68 mbarg] (0002) to 29" Hg [982 mbarg] (0029) vacuum

KUNKLE
953 Old U.S. Highway 70
Black Mountain, North Carolina 28711-2549
Customer Service Phone: 1-828-669-3700
www.kunklevalve.com

PRODUCT SELECTION GUIDE

ILFV Series Vacuum Service Inline Air Filters

ILFV-4 filter

Built to Suit Your Application

- Designed for vacuum service application requirements.
- Optional design features for special production and assembly conditions are available.
- Special materials such as stainless steel are available.
- Interchangeable paper or felt elements, for desired filtration characteristics in the same housing.
- Filter restriction gauges are optional for all units.

Durable Construction

- Carbon steel construction with a high-quality blue semi-gloss enamel finish.
- Removable top plate for easy access to the filter element.

Immediate Availability

- Fast delivery for most sizes.

Advanced Design and Testing

- Our extensive in-house engineering, manufacturing, and testing facilities ensure optimized process, mechanical, and acoustic performance for your application.

Quality You Can Count On

Universal Silencer's new ILFV Series of inline air filters has been designed especially for vacuum applications as an economical alternative to our ILF Series. Choose from ten standard pipe sizes ranging from 2 in. to 14 in. and flow capacities ranging from 120 to 5900 CFM. Two choices of filter element media — pleated paper or pleated felt — are available to suit your specific application.

Universal's Filter Restriction Gauge provides a convenient, accurate means of monitoring filter pressure drop as the filter element becomes increasingly loaded with dirt. Inline air filters are standard with threaded connections for directly mounting the gauge. See product bulletin 81-1234 for a complete description.

Celebrating 50 YEARS of Success 1959–2009

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Acoustic & Emission Technologies

608-873-4272 Fax 608-873-4298
P.O. Box 411 Stoughton, WI 53589
info@universalAET.com
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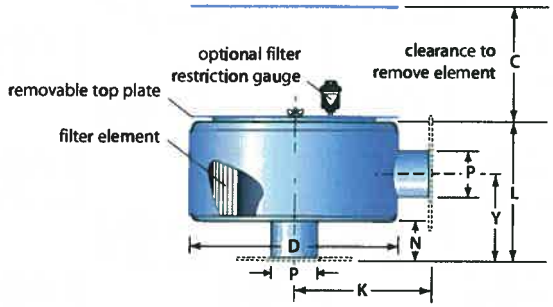
SPECIFICATIONS

ILFV Series Vacuum Service Inline Air Filters



DIMENSIONS, WEIGHTS, AND REPLACEMENT ELEMENTS

Model	P (nom.)	D	L	N	Y	C	K	Weight (est.)	Rated Cap. (CFM)	Element Part No. Paper	Element Part No. Felt
ILFV-2	2	14	9.38	3.5	6.44	7	10	18	120	81-1063	81-1205
ILFV-2 1/2	2 1/2	14	9.38	3.5	6.44	7	10	19	190	81-1063	81-1205
ILFV-3	3	14	9.38	3.5	6.44	7	10	20	275	81-1063	81-1205
ILFV-4	4	14	9.38	3.5	6.44	7	10	21	500	81-1063	81-1205
ILFV-5	5	18	12.00	3.5	7.75	10	12	50	750	81-0475	81-1207
ILFV-6	6	18	20.56	3.5	12.00	10	12	65	1100	(2) 81-0475	(2) 81-1207
ILFV-8	8	24	13.19	3.5	8.35	11	15	90	2200	81-1163	81-1209
ILFV-10	10	24	22.69	3.5	13.00	11	15	125	3000	(2) 81-1163	(2) 81-1209
ILFV-12	12	30	17.19	3.5	10.35	15	18	160	4300	81-1164	81-1210
ILFV-14	14	30	30.69	3.5	17.00	15	18	205	5900	(2) 81-1164	(2) 81-1210

- All models have a 1/8 in. FNPT tap for installation of a gauge or manometer to monitor pressure drop.
- The C dimension is clearance required to remove elements.
- Non-ASME code construction is suitable for 15" Hg vacuum. Not applicable for pressure applications.
- Rated capacity is based upon flow velocity of approximately 5500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%.
- Flange connections are drilled per ANSI standard for each size.
- Sizes 2" through 4" are standard with male pipe threaded inlet and outlet fitting (MNPT).
- Sizes 5" through 14" are standard with plate flanges drilled to ANSI standards (dashed lines on sketch).
- Weight does not include filter elements.

FILTER ELEMENTS

Two types of filter elements are available for Universal Silencer's vacuum service inline air filters. The pleated paper elements provide the highest efficiency and are considered standard. Pleated felt elements are available for less demanding service, with respect to efficiency. Both types of elements are completely interchangeable and will fit the ILFV filter housings.

SERVICE INTERVALS: Paper and felt elements are typically cleaned or replaced when the air flow resistance has increased 4 inches of water over the initial clean resistance. The maximum restriction recommended across the filter elements is 20 inches of water, but this value may be greater than the equipment can tolerate for best efficiency.

Pleated Paper Element

SPECIFICATIONS:

- High-quality industrial-grade filter paper—pleated and oven-cured during production.
- Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 8 in. through 14 in. have metal end caps with closed-cell rubber gaskets).
- Media efficiency: 99.5% on 2 microns; 97% on 1 micron.
- Maximum operating temperature: 200° F for units with 2 in. through 14 in. pipe sizes.

SERVICE INSTRUCTIONS:

Because of the low cost of the paper element, it is generally treated as a consumable and replaced when dirty. However, depending upon customer preference, the paper element may be cleaned with compressed air and reused.

Compressed Air Cleaning:

Carefully direct compressed air (100 PSI maximum) through the dry element, opposite the normal direction of flow. After cleaning, inspect carefully for holes or cracks. If the element is damaged, replace it.

Pleated Felt Element

SPECIFICATIONS:

- Durable polyester felt media — pleated.
- Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 8 in. through 14 in. have metal end caps with closed-cell rubber gaskets).
- Media efficiency: 99% on 10 microns.
- Maximum operating temperature: 200° F for units with 2 in. through 8 in. pipe sizes.

  250° F for units with 10 in. through 14 in. pipe sizes using elements with metal end caps.

SERVICE INSTRUCTIONS:

Pleated felt elements may be cleaned with compressed air or water and reused.

Water Cleaning:

Rap the element gently to dislodge accumulated dirt, and soak it thoroughly approximately 15 minutes in warm water and mild detergent. Rinse thoroughly under low-pressure water. Air dry—do not dry with compressed air. After cleaning, inspect carefully for holes or cracks. If the element is damaged, replace it.

"Big Boy" Filter Silencers

"FS" Series 6" - 14" 125/150# Pattern Flange

APPLICATIONS & EQUIPMENT

- Industrial & Severe Duty
- Blowers - Side Channel & P.D.
- Piston Compressors
- Screw Compressors
- Hydraulic Breathers – fine filtration
- Engines
- Fans
- Construction Industry
- Medical
- Pneumatic Conveying
- Waste Water Aeration
- Sparging
- Cement
- Power Plants
- Vacuum Vent Breathers

FEATURES & SPECIFICATIONS

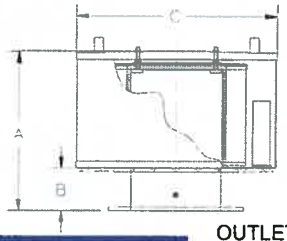
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Tubular silencing design - tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- Durable carbon steel construction with gray baked enamel finish
- Low pressure drop center bracket and outlet pipe design
- Several element sizes available per given connection (safety factor)
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10"-15" H_2O over initial delta P
- Pressure drop graphs available upon request

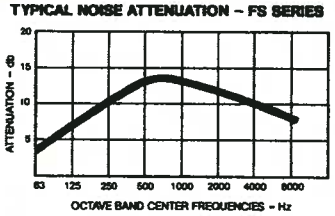
OPTIONS (Inquiries Encouraged)

- Various media available
- 1/8" tap holes
- Pressure Drop Indicator
- Side Access Silencer Filters for space restricted enclosures (Selected models)
- Available in ***Stainless Steel***
- Epoxy coated housings
- Single Barrel Lg. Flow Mega Boy Filters

CONFIGURATION

DRAWING





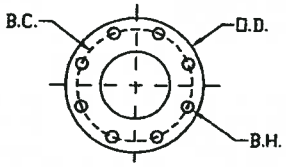
• Noise attenuation may vary due to the wide range of applications and machines

I = Industrial Duty S = Severe Duty E = Extreme Duty

Dimension tolerance ± 1/4"

	with Polyester Element	with Paper Element	FLG Outlet	DIMENSIONS - inches A	B	C	Rated Flow SCFM Piston	Screw, Blower, Fan	Element Rating	No. of Silencing Tubes	Approx. Wt. lbs
E	FS-377P-600	FS-376P-600	6" MPT	22	5	22 1/2	1100	1100	1825	6	90
E	FS-377P-600F	FS-376P-600F	6"	22	5	22 1/2	1100	1100	1825	6	95
I	FS-377P-800F	FS-376P-800F	8"	23	6	22 1/2	1440	1800	1825	12	105
S	FS-385P-800F	FS-384P-800F	8"	23	6	28 1/2	1440	1800	3295	12	125
E	FS-485P-800F	FS-484P-800F	8"	31	6	28 1/2	1800	1800	4705	12	138
I	FS-385P-1000F	FS-384P-1000F	10"	23	6	28 1/2	1800	3300	3300	16	130
S	FS-485P-1000F	FS-484P-1000F	10"	31	6	28 1/2	2600	3300	4705	16	143
E	FS-685P-1000F	FS-384P(2)-1000F	10"	38	6	28 1/2	2880	3300	6600	16	165
I	FS-385P-1200F	FS-384P-1200F	12"	23	6	28 1/2	2600	3300	3300	24	135
S	FS-485P-1200F	FS-484P-1200F	12"	31	6	28 1/2	2600	4700	4705	24	155
E	FS-685P-1200F	FS-384P(2)-1200F	12"	38	6	28 1/2	3500	4700	6600	24	175
E	FS-485P(2)-1200F	FS-484P(2)-1200F	12"	53	6	28 1/2	4320	4700	9410	24	195
S	FS-485P(2)-1400F	FS-484P(2)-1400F	14"	53	6	28 1/2	5400	6000	9410	18	245

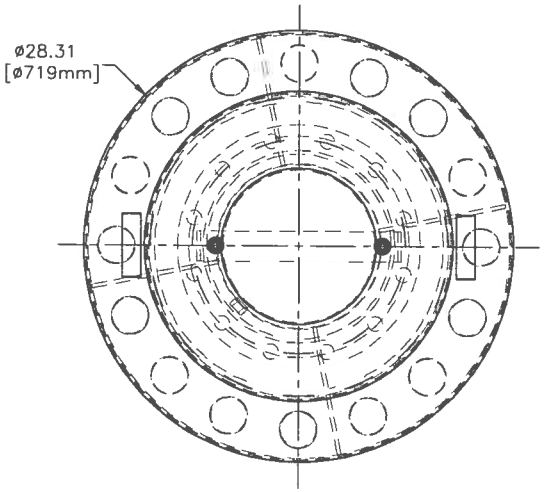
125/150# Pattern Flg	DIMENSIONS - inches O.D.	B.C.	B.H.	No. of Holes	Flange Thickness
6"	11	9 1/2	0.88	8	0.38
8"	13 1/2	11 3/4	0.88	8	0.38
10"	16	14 1/4	1	12	0.38
12"	19	17	1	12	0.5
14"	21	18 3/4	1 1/2	12	0.5



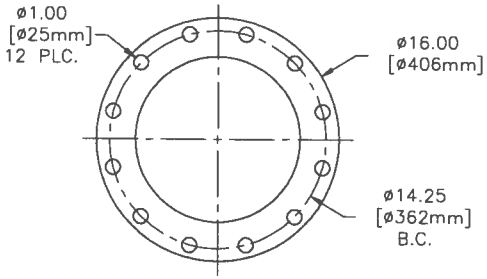
Note: Model offerings and design parameters may change without notice.

1151 Ardmore Ave. • Itasca, IL 60143 USA
Sales/Service: 630.773.1363 • Fax: 630.773.0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

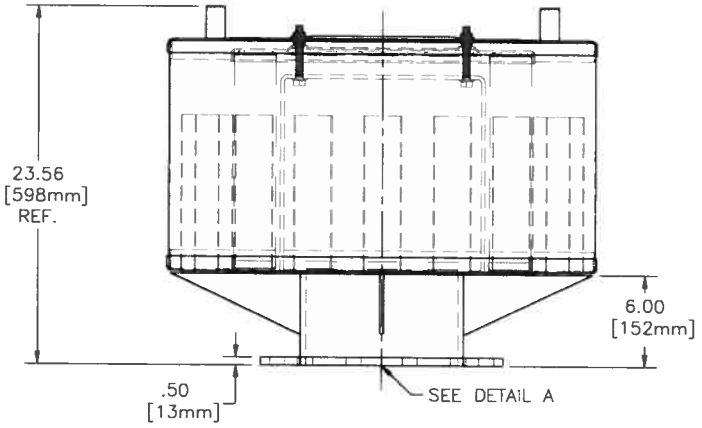
REVISIONS						
ZONE	REV	DESCRIPTION	ECN #	CHG BY	DATE	APP'D



10.00 FLANGE
BOLT PATTERN



DETAIL A
SCALE 1:1



REPLACEMENT ELEMENT# 385P	
MATERIAL	POLYESTER
CFM FLOW	3300
SURFACE AREA	50 SQ. FT.
I.D.	14.00
O.D.	19.63
HEIGHT	14.50

MODEL#	HOUSING MATERIAL	FINISH
FS-385P-1000F	CARBON STEEL	BAKED ENAMEL GREY

UNLESS OTHERWISE SPECIFIED:
- DIMENSIONS ARE IN INCHES
- REF: APPROXIMATE DIMENSIONS, NO TOLERANCES APPLY
- TOLERANCES ARE:

DECIMALS: .XX ±.25, .XXX ±.125
ANGLES ±2°

CUSTOMER APPROVAL:

SOLBERG MANUFACTURING INC.
1151 W. ARDMORE AVE.
ITASCA, IL 60143
630/773-1363

DESCRIPTION: FS-385P-1000F

SALES REP.: H.DALL

APPROVALS	DATE
DRAWN: ABL	07/17/07
APPROVED:	

SHEET: 1 of 1 | SHEET SIZE: C | SCALE: 1:6

DRAWING NUMBER: SD12988 | REV: —

DWYER Gauge, Differential

Differential Pressure Gauge, Pressure Range 0-60.0 Inches WC, Pressure Range Minor Divisions 2.00, Rated Total Pressure -20 Inches Hg to 15 PSIG, Differential Pressure

Grainger Item #	1W473
Price (ea.)	$92.80
Brand	DWYER
Mfr. Model #	2060
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	1.9
Availability	Ready to Ship
Catalog Page No.	772
Country of Origin (Country of Origin is subject to change.)	USA

Enlarge Image

Qty

Add Grainger TripleGuard® repair & replacement coverage for $16.95 each

Add to Order | Add to Personal List | Compare Alternates

Price shown may not reflect your price. Sign in or register

When can I get it? Use your ZIP code to estimate availability.

Qty ZIP code Go

Tech Specs | Additional Information | Compliance & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products | Repair Parts

Item	Differential Pressure Gauge
Scale Type	Pressure
Differential Pressure Range	0 to 60" WC
Pressure Range Minor Div.	2.00" WC
Rated Total Pressure	-20" Hg to 15 psi
Full Scale Accuracy (%)	+/-2
Connection Size NPT (In.)	1/8
Dial Size (In.)	4
Ambient Operating Range (F)	20 Degrees to 140 Degrees
Includes	Instructions, Two 1/8" NPT Plugs, Two 1/8" NPT to 3/16" I.D. Rubber Tubing Adapters and Three Mounting Adapters with Screws
Manufacturers Warranty Length	1 Year

Optional Accessories

More Accessories

Gage Portable Kit
Brand: DWYER INSTRUMENTS
Grainger Item #: 2T648
Price (ea.): $40.60
Qty Add to Order

Customers Also Purchased 1 of 5

Standard Battery, Alkaline, AA, PK 24
Brand: DURACELL
Grainger Item #: 2HYL8
Price: $34.95
Qty Add to Order

Lobby Broom
Brand: TOUGH GUY
Grainger Item #: 1VAC2
Price: $11.70
Qty Add to Order

Broom, Angle
Brand: RUBBERMAID
Grainger Item #: 1CF98
Price: $29.15
Qty Add to Order

Sealant Tape, 1/2 x 260 In
Brand: ANTI-SEIZE
Grainger Item #: 4X227
Price: $2.11
Qty Add to Order

Surge Protector, Outlet Strip, 120V, 490J
Brand: APC
Grainger Item #: 6PYG5
Price: $10.92
Qty Add to Order

Other Popular Terms for this Product

- Gages (1987)
- Pressure Gauges (1731)
- Vacuum Gauges (286)
- Differential Pressure Gauges (195)
- HVAC Gauges (169)
- Air Velocity Gauges (56)

View Catalog Page | View Printable Page

Return To Top

DWYER Gauge, Differential

Test Instruments > Pressure and Vacuum Measuring > Differential Pressure Gauges

Differential Pressure Gauge, Pressure Range 0-15.0 Inches WC, Pressure Range Minor Divisions 0.50, Rated Total Pressure -20 Inches Hg to 15 PSIG, Differential Pressure

Grainger Item #	1W481
Price (ea.)	$92.80
Brand	DWYER
Mfr. Model #	2015
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	1.9
Availability	Ready to Ship
Catalog Page No.	772
Country of Origin (Country of Origin is subject to change.)	USA

Qty. Enlarge Image

Add Grainger TripleGuard® repair & replacement coverage for $16.95 each

Add to Order | Add to Personal List | Compare Alternates

Price shown may not reflect your price. Sign in or register.

When can I get it? Use your ZIP code to estimate availability.

Qty: ZIP code: Go

Tech Specs | Additional Information | Compliance & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products | Repair Parts

Item	Differential Pressure Gauge
Scale Type	Pressure
Differential Pressure Range	0 to 15" WC
Pressure Range Minor Div.	0.50" WC
Rated Total Pressure	-20" Hg to 15 psi
Full Scale Accuracy (%)	+/-2
Connection Size NPT (In.)	1/8
Dial Size (In.)	4
Ambient Operating Range (F)	20 Degrees to 140 Degrees
Includes	Instructions, Two 1/8" NPT Plugs, Two 1/8" NPT to 3/16" I.D. Rubber Tubing Adapters and Three Mounting Adapters with Screws
Manufacturers Warranty Length	1 Year

Customers Also Purchased

1 of 5

Hex Key Set, Ball End, SAE, 13 Pc	Reflector, Round	Detector, Voltage	20x25x1, Pleated Air Filter, MERV 7	Headlight, 3 AAA, 6 LEDs, Spot To Flood
Brand: EKLIND	Brand: SCHNEIDER ELECTRIC	Brand: FLUKE	Brand: AIR HANDLER	Brand: ENERGIZER
Grainger Item #: 3A594	Grainger Item #: 5B317	Grainger Item #: 2KU25	Grainger Item #: 5W512	Grainger Item #: 1LEE1
Price: $20.04	Price: $8.60	Price: $32.95	Price: $7.67	Price: $28.55
Qty Add to Order	Qty Add to Order	Qty Add to Order	Qty Add to Order	Qty Add to Order

Other Popular Terms for this Product

- Gages (1987)
- Pressure Gauges (1731)
- Vacuum Gauges (286)
- Differential Pressure Gauges (195)
- HVAC Gauges (169)
- Air Velocity Gauges (56)

View Catalog Page | View Printable Page

Return To Top

Optional Accessories

More Accessories

Gage Portable Kit
Brand: DWYER INSTRUMENTS
Grainger Item #: 2T648
Price (ea.): $40.80
Qty Add to Order

Customers Also Viewed

Gauge, Differential
Brand: DWYER
Grainger Item #: 3T318
Price: $92.80
Qty Add to Order

Gauge, Differential
Brand: DWYER
Grainger Item #: 3T317
Price: $92.80
Qty Add to Order

Gauge, Differential
Brand: DWYER
Grainger Item #: 3T316
Price: $92.80
Qty Add to Order

Gauge, Differential
Brand: DWYER
Grainger Item #: 3T315
Price: $99.70
Qty Add to Order

INDUMART Canada
www.indumart.com

Fillable Standard Pressure Gauges

SERIES: P16

Dial: 1½", 2", 2½", 4"
Accuracy: 1.6%, 2.5%

DESCRIPTION

Indumart *P16 Series* Fillable Standard Pressure Gauges are used at measuring points with high dynamic alternating loads and strong vibrations and pulses. The glycerin filling of the case provides lubrication of the moving parts which protects the measuring system against wear and at the same time ensures smooth pointer movement and thus good readability.

Indumart *P16 Series* pressure gauges have a high level of functional safety and long service lives. These gauges are suitable for applications in hydraulics, compressors and pumps.

Various types of wall or panel mounting configurations are available.

SPECIFICATIONS

Accuracy	1.6% (2½" & 4" dials); 2.5% (1½" & 2" dials)
Dial Sizes	1½" (40 mm), 2" (50 mm), 2½" (63 mm), 4" (100 mm)
Case	St. steel (standard)
Bezel	St. steel; crimped bezel
Connection	Centre back or bottom
Thread	⅛" NPT (1½" dial only), ¼" NPT (2", 2½", 4" dials) ½" NPT (option for 4" dial), BSP thread (option)
Window	Plexiglas
Bourdon Tube	Brass (std.), st. steel (option)
Max. Temperature	60°C
Range	0...10 to 0...8000 psi; 0...60 to 0...60000 kPa; 0...0.6 to 0...600 bar Vacuum and compound ranges are available; see the Range Table

ORDER CODES

Model P16 ☐ ☐ – ☐

CONNECTION
Back — K
Bottom — T

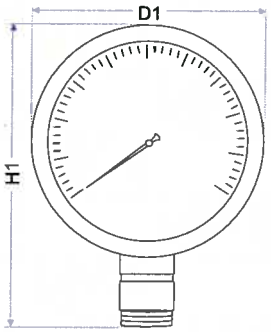
DIAL SIZE
40 mm (1½") — 0
50 mm (2") — 1
63 mm (2½") — 2
100 mm (4") — 4

OPTIONS (more than one option may be selected)

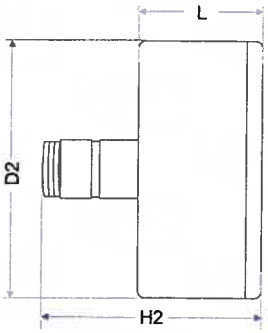
Glycerine Filling	FG
Silicon Filling	FS
St. Steel Internal	IT
½" Process Connection (100 mm dial only)	TH
BSP Thread	TB
Back Flange for Wall Mounting (not for 40 mm dial)	MK
Front Flange for Panel Mounting (not for 40 mm dial)	MF
Clamp with 2 Screws (63 mm dial only)	MS

Example: P16T2-FG,IT

DIMENSIONS (mm) & WEIGHT				
	Ø40 mm	Ø50 mm	Ø63 mm	Ø100 mm
D1	45	55	68	111
D2	41	51	63	100
H1	70	75	84	145
H2	47	52	57	74
L	29	30	30	35
Weight (g)	100	100	150	400



Bottom connection



Centre back connection

Specifications may change without prior notice.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

General Information

Blower Silencers

Rotary Positive Blowers

The Rotary Positive Blower is a two impeller compressor that delivers a large quantity of gas or air relative to the individual pulses. Blower capacities are expressed in CFM at inlet conditions (ICFM). Blower size is usually expressed as gear diameter by rotor length. Pitch Line Velocity (PLV) is the peripheral velocity of the timing gear—equal to the product of the gear circumference and the rotative speed of the blower, usually expressed in feet per minute (FPM).

The blower presents two problems:
1) pulsation within the piping system and,
2) noise radiation in the vicinity of the blower and piping.

The importance of these relative to each other is a function of blower size and speed; both increase proportionately to the blower size and the square of the speed.

Pulsation is more pronounced on the discharge side. Peak pulse pressures are quite severe and can result in unsilenced discharge sound power levels up to 140–145 dB. The inlet, although producing less severe pulsation and noise, receives equal attention since the inlet is usually open to atmosphere and the noise much more apparent.

Silencers

There is little question that silencers are a necessity on any blower installation. Regardless of the size or speed of the blower, silencers of some type are nearly always used.

In the selection of blower silencers, there are two basic considerations: 1) the silencer must be the correct size (i.e., sufficient capacity for the volume flow) and, 2) the silencer must be the proper type for the application. The nominal silencer size need only be based on the gas volume, (i.e., the CFM of the gas or air at the operating conditions). However, the silencer (design) must be selected with consideration of the blower size and operating speed. Complete application and capacity information is given on page 2.3.

There are two types of silencers commonly used on positive blowers: a reactive type silencer which consists of a series of expansion chambers having interconnecting tubes, a more sophisticated silencer design. is the combination chamber-absorptive type. This combination silencer is similar to the reactive type with the exception that an acoustically-packed, sound absorbing section is included, comprising an extension of the silencer connection closest to the blower. The inlet of a discharge silencer and the outlet of an inlet silencer are the ends having the packed section.

A third basic type of silencer—the simple, straight-through packed type—is occasionally used on blowers. This type of silencer is usually used on small, high speed machines which characteristically produce significant high frequency noise and relatively mild pulsations.

The PLV is normally the criterion for silencer type selection. If the blower is operating in the critical PLV range, it will generate objectionable high frequency noise which may cause shell ring or tank hammer in the piping and silencer. These critical PLV conditions will always require a combination chamber-absorptive silencer for satisfactory results.

Inlet Silencers

For inlet service, a PLV of 3,300 ft/min or greater is considered critical. This transition speed is empirically established and is somewhat arbitrary, however, it is commonly accepted that blowers operating at or above 3,300 ft/min are considered critical for the purpose of inlet silencer application. Those operating below 3,300 ft/min are considered subcritical. Subcritical PLV applications can usually be silenced adequately with a chamber-type silencer, such as Universal URB or UCI Series. Blowers operating above the critical PLV of 3,300 ft/min will invariably require the RIS Series combination chamber-absorptive type silencer. Inlet Filters or Filter Silencers are commonly used on blower inlets, either individually or in series with a separate inlet silencer. Please reference the Filters and Filter Silencers section of this catalog for further information.

In a closed blower discharge system, structure-borne noise—such as that radiated by pipe wall and silencer shell—may be a consideration, particularly where a stringent, close-proximity noise specification applies. For these applications, various means are available to treat the pipe and shell radiated noise, such that most reasonable specifications may be met.

For instance, it is possible to lag the silencer shell externally and reduce any shell noise contribution to below the casing and mechanical noise of the blower and driving machinery.

Universal Silencer invites your inquiries concerning special applications where EPA, OSHA or other noise specifications apply. Special applications are handled on an individual basis and recommendations are made according to specific requirements of the installation.

Discharge Silencers

For the more severe discharge conditions of typical blower installations, a PLV of 2,700 ft/min is accepted as the critical transition speed. Blowers operating below 2,700 ft/min are considered subcritical and can usually be adequately silenced on the discharge side by use of a chamber-type silencer UCD or URD Series. Machines operating above the 2700 ft/min transition speed will require combination chamber-absorptive silencers such as SD or RD Series.

In some larger blower installations, piping requirements or space restrictions may preclude the use of a large, single discharge silencer such as the SD or RD Series.

Where two or more blowers discharge into a common header, individual silencers upstream of the header are required to subdue the individual blower pulsations. Otherwise, the pulsations tend to beat with each other and can be extremely objectionable.

Note: Silencers should be mounted as close to the blower as possible since any piping between the blower and silencer will radiate noise. Standard silencer connections are not designed to carry external piping or valve loads, so good piping support practices should be used to prevent stresses that cause fatigue and eventual fracture of the silencer or piping. It is also good practice to isolate the blower from the silencer with a flexible expansion joint. Contact Universal Silencer for special design considerations where loading is a factor.

Attenuation Curves

Noise attenuation curves are given for the various models within this section.
The curves represent insertion loss of airborne noise for typical applications under average conditions. It is not feasible to chart the expected performance of a silencer over a wide range of applications and conditions, therefore, the curves must be used with discretion. Structure-borne noise (see above) may be a consideration and will require separate analysis, since it is not airborne noise and not used for silencer performance rating.

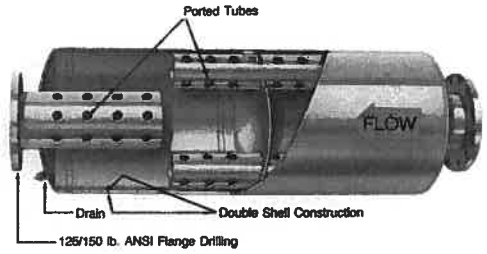
General Information

Rotary Positive Blowers

The silencers shown below are more fully described on the individual catalog pages. These units are designed specifically for use on Rotary Positive Blowers.

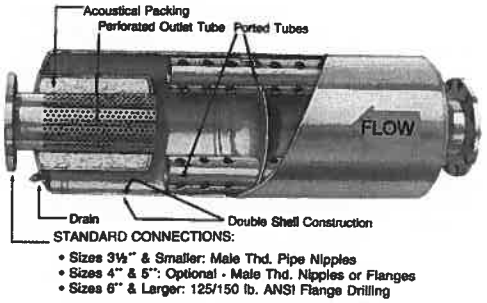
There are fundamental similarities between blower silencers and other types, particularly reciprocating engine silencers, which also require a silencer design that provides effective pulse control as well as noise attenuation. However, blower silencers generally must be constructed more ruggedly to withstand prolonged exposure to severe pulsations produced by the blower.

All silencers described are of standard with end in, end-out design. Low or high side inlet and outlet connections are available and are described on the individual catalog pages.



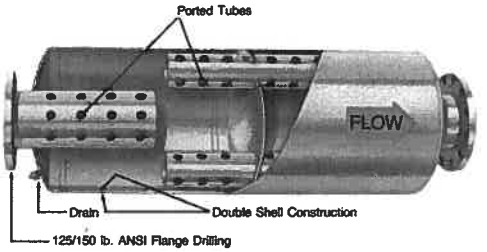
UCI Series
Inlet Silencer

Chamber-type inlet silencer for use on sub-critical PLV applications. Available in pipe sizes 8"–30". Smaller sizes use URB Series. Available with side connections and mounting brackets.



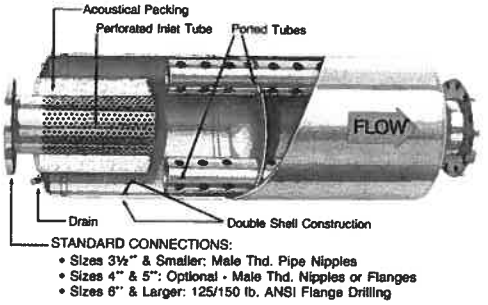
RIS Series
Inlet Silencer

Combustion chamber-absorptive type inlet silencer for critical PLV applications. Available in pipe sizes 2"–30". Low or high side outlet and mounting brackets available on most sizes.



UCD Series
URB/URD Series
Discharge Silencers

Chamber-type discharge silencer for use on sub-critical PLV applications. Available in pipe sizes 8"–30". (Smaller sizes use URB Series). Low, high, or opposed side connections and mounting brackets available.



SD Series
RD Series
Discharge Silencers

Combination chamber-absorptive type discharge silencers for critical PLV applications. Available in pipe sizes 2"–30". Low, high, or opposed side connections and mounting brackets available on most sizes.

Accessories, Special Features

- Mounting Brackets
- Inspection Openings
- Pressure Vessel Construction
- Oversize Flanges
- Special Finishes
- Special Materials

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Application, Capacity, Pressure Drop Data

Blower Silencers

Silencer Recommendations

As mentioned on page 2.1 pitch line velocity (PLV) is the speed of the timing gear in feet per minute (ft/min). For purposes of silencer application. PLV is considered "critical" at 3,300 ft/min for intake and 2,700 ft/min for discharge.

Table 1 gives transition speeds in RPM. Blowers running at these speeds or greater will have critical PLV. Operating speeds below transition will be in the sub-critical range. Blowers operating in the sub-critical speed range usually require only simple chamber-type silencers while those in the critical range require combination chamber-absorptive type silencers. If there is doubt, it is best to use the combination-type silencers. When gear size and operating speeds are known, the proper type silencer is easily selected.

Silencer Size Selection, Capacity

Table 3 gives the nominal capacity of the various size silencers. "Size" in this table refers to the silencer "nominal size," or its "inlet size." Capacities are expressed in inlet CFM (ICFM), thus, discharge silencers are rated at higher capacities than inlet silencers since the air is compressed to reduced volume at the discharge operating pressure.

A From Table 1 determine whether blower RPM is above or below the transition speed for critical PLV.

B Consult Table 2 for recommended silencer models.

Pressure Drop

The following formulas may be used to calculate pressure drop through the silencers covered in this catalog.

Inlet: $$\Delta P = \left(\frac{V}{4005}\right)^2 C$$

(assumes silencer inlet is open to atmosphere)

Discharge: $$\Delta P = \left(\frac{V}{4005}\right)^2 C \times \frac{P}{14.7} \times \frac{530}{T}$$

ΔP = pressure drop through silencer, inches of water

V = air velocity through silencer, ft/min*

C = individual silencer restriction coefficient—empirical constant (see Table 4)

P = discharge pressure, PSIA (operating pressure in PSIG + 14.7)

T = discharge temperature, °R absolute (operating temperature in °F + 460)

* To calculate velocity through silencer, divide flow in ACFM by cross-sectional area of silencer inlet diameter in square feet.

1 Blower Transition Speed

Blower Gear Size	Transition Speed-RPM	
	Inlet	Discharge
2	6,300	5,155
2½	5,040	4,125
3	4,200	3,435
4	3,150	2,575
5	2,520	2,060
6	2,100	1,720
7	1,800	1,470
8	1,575	1,290
10	1,260	1,030
12	1,050	860
14	900	735
16	785	645
18	700	570
20	630	515
22	570	470
24	525	430

2 Silencer Model Specifications

Pitch Line Velocity	Inlet Silencer	Discharge Silencer
Below Transition	UCI, URB	URB, UCD, URD
Above Transition	RIS	SD, RD

4 Pressure Drop Coefficients

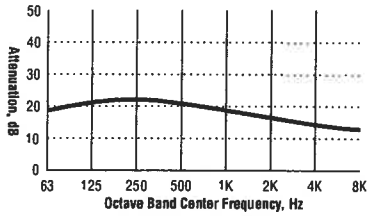
Model	Pressure Drop Coefficient (C)
URB, URBY	4.2
UCI, UCIY, UCIH	4.2
RIS, RISY, RISH	4.2
UCD, UCDY	4.2
URD, URDY, URDH	4.2
SD, SDY, SDH	4.2
RD, RDY, RDH	4.2
RDS, SDS, URDS	7.0

3 Silencer Capacity

Size	Capacity (Inlet CFM 14.7 PSIA at 70°F)					
	Inlet Silencer	Discharge Silencer				
		4 PSIG	6 PSIG	8 PSIG	10 PSIG	15 PSIG
1	30	35	40	40	40	45
1½	70	80	85	90	95	105
2	120	140	150	160	165	185
2½	190	220	235	245	255	285
3	270	320	335	355	370	415
3½	370	430	455	480	505	560
4	480	560	600	630	660	735
5	750	880	935	985	1,030	1,150
6	1,080	1,260	1,340	1,410	1,480	1,650
8	1,920	2,250	2,390	2,510	2,630	2,940
10	3,000	3,520	3,730	3,930	4,110	4,590
12	4,300	5,070	5,370	5,660	5,920	6,600
14	5,900	6,890	7,310	7,700	8,060	8,990
16	7,700	9,000	9,550	10,000	10,500	11,800
18	9,700	11,400	12,100	12,700	13,300	14,900
20	12,000	14,000	14,900	15,700	16,400	18,400
22	14,500	17,000	18,100	19,000	19,900	22,200
24	17,300	20,200	21,500	22,600	23,700	26,400
26	20,300	23,800	25,200	26,600	27,800	31,000
28	23,500	27,600	29,300	30,800	32,200	36,000
30	27,000	31,700	33,600	35,400	37,000	41,300
Est Temp.	70°F	115°F	140°F	165°F	190°F	240°F

∴ See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve

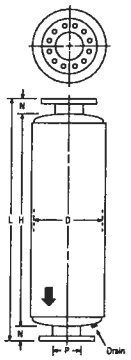


Specifications
UCI Group

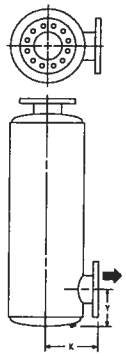
Chamber Type Inlet Silencer

The UCI Series Inlet Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It provides pulse control and silencing for most subcritical PLV applications. Sizes 8" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications. Exterior surfaces receive a shop coat of rust-inhibitive primer and may be finish painted in the field if desired. The UCI Series is the basic inlet model and is the conventional end-in,end-out version. The low side inlet model is designated UCIY Series and the high side inlet type is designated UCIH Series. The three types are fundamentally alike and performance is identical. Mounting brackets and other options are available—see page 2.11.

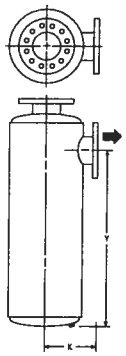
UCI Series



UCIY Series
(Low Side Outlet)



UCIH Series
(High Side Outlet)



Chamber Type Inlet Silencers

P (Size)	Part Number	D	L	N	H	K	Y UCIY Min	Y UCIY Max	Y UCIH Min	Y UCIH Max	Weight
1											
1½											
2											
2½											
3											
3½											
4											
5											
6											
8	53-108-AA	22	61	3½	54	14½	9	21	28½	45½	250
10	53-110-AA	26	74	3½	67	16½	11	27	34½	57	360
12	53-112-AA	30	87	3½	80	18½	12½	34	41	69	550
14	53-114-AA	30	99	3½	92	18½	13½	40	47½	80½	650
16	53-116-AA	36	113	3½	106	21½	15½	48	53½	91½	950
18	53-118-AA	42	126	3½	119	24½	17½	55½	59½	103½	1,200
20	53-120-AA	42	140	4½	131	25½	19	60½	67	114	1,350
22	53-122-AA	48	153	4½	144	28½	20½	66½	75	126	1,950
24	53-124-AA	54	167	4½	158	31½	22½	72	83	138	2,500
26	53-126-AA	54	179	4½	170	31½	23½	85	84	149	2,750
28	53-128-AA	60	193	4½	184	34½	25½	87	91	161	3,400
30	53-130-AA	66	206	4½	197	37½	27½	95	100	173	4,650

Sizes 1"–6" Use URB Series (page 2.7)

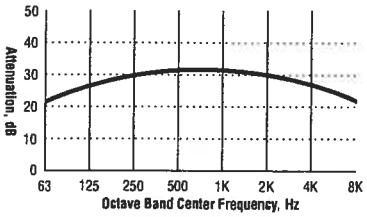
Note: Dimensions and weights are nominal and may vary slightly with production models.
Request certified drawings of specific models for exact dimensions.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Specifications RIS Group

Combination Chamber-Absorptive Type Inlet Silencer

Typical Attenuation Curve

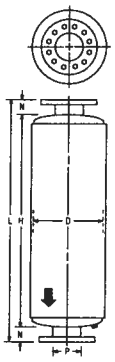


The RIS Series Inlet Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It features an acoustically-treated outlet and will provide pulse control and silencing suitable for critical PLV applications. Sizes 4" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications.

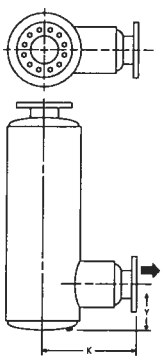
Smaller sizes are standard with male threaded pipe nipples. Units sized 4" and 5" are available in either flanged or male pipe threads. Exterior surfaces receive a shop coat of rust inhibitive primer and may be finish painted in the field if desired.
The RIS Series is the basic model, having conventional end-in, end-out configuration.

A low side outlet version is designated RISY Series and high side outlet configuration is designated RISH Series. The three types are fundamentally alike and performance is identical. Mounting brackets and other options are available—see page 2.11.

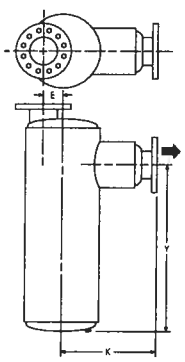
RIS Series



RISY Series
(Low Side Outlet)



RISH Series
(High Side Outlet)



Combination Chamber-Absorptive Type Inlet Silencers

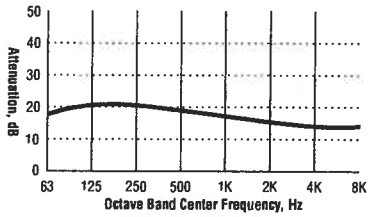
P (Size)	Part Number	D	L	N	H	K		E	Y				Weight
						RISY	RISH		RISY		RISH		
									Min	Max	Min	Max	
1													
1½						*Sizes 1"–1½" use US Series (page 3.2)*							
2	54-102-AA	8	28½	3	22½	8½	—	—	FIXED AT 6				25
2½	54-125-AA	8	33	3	27	9	—	—	FIXED AT 7		2½" THRU 3½"		25
3	54-103-AA	8	39	3	33	10	—	—	FIXED AT 7		AVAILABLE ON		30
3½	54-135-AA	10	39½	3	33½	11	—	—	FIXED AT 8		SPECIAL ORDER		40
4	54-104-AA*	10	45	3	39	12½	14½	2¼	7½	16½	30½	32½	50
5	54-105-AA*	12	57½	3	51½	15½	17½	2¾	9	23	40	43½	80
6	54-106-AA	14	64	3	58	17	20	3¼	9	25½	43½	49	110
8	54-108-AA	18	72	3½	65	21½	26½	4	12	30½	49½	54	190
10	54-110-AA	22	85	3½	78	25½	32½	5	13½	37	61½	65½	380
12	54-112-AA	26	98	3½	91	29½	38	6	15	44	69	77	550
14	54-114-AA	30	111	3½	104	30	40	7½	16½	50	81	89½	800
16	54-116-AA	36	113	3½	106	35½	49½	0	18½	51	56½	88½	1,050
18	54-118-AA	42	126	3½	119	41	57½	0	20½	58½	62½	100½	1,350
20	54-120-AA	42	140	4½	131	47	62½	0	22	63½	70	111	1,500
22	54-122-AA	48	153	4½	144	46½	65½	0	23½	69½	78	123	2,100
24	54-124-AA	54	167	4½	158	54	75½	0	25½	75	86	135	2,700
26	54-126-AA	54	179	4½	170	55½	76	0	25½	87	86	147	3,050
28	54-128-AA	60	193	4½	184	61	84½	0	29½	91	95	157	3,850
30	54-130-AA	66	206	4½	197	66½	93½	0	30½	98	103	170	5,150

Note: Dimensions and weights are nominal and may vary slightly with production models.
Request certified drawings of specific models for exact dimensions.

*Specify -TT for male pipe threaded units.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve

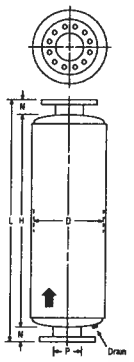


Specifications
UCD Group

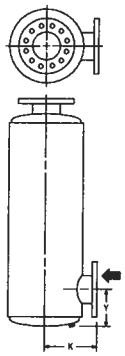
Chamber Type Discharge Silencer

The UCD Series Discharge Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It provides pulse control and silencing for subcritical PLV applications where the higher performance of the URD Series on page 2.7 is not warranted. Sizes 8" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications. Exterior surfaces receive a shop coat of rust-inhibitive primer and may be finish painted in the field if desired. The UCD Series is the basic end-in, end-out configuration. A low side inlet version is designated UCDY Series. The two types are fundamentally alike and performance characteristics are identical. Mounting brackets and other options are available—see page 2.11.

UCD Series



UCDY Series
(Low Side Inlet)



Chamber Type Discharge Silencers

P (Size)	Part Number	D	L	N	H	K	Y Min	Y Max	Weight
1									
1½									
2									
2½									
3									
3½									
4									
5									
6									
8	56-108-AA	22	61	3½	54	14½	9	21	250
10	56-110-AA	26	74	3½	67	16½	11	27	360
12	56-112-AA	30	87	3½	80	18½	12½	34	550
14	56-114-AA	30	99	3½	92	18½	13½	40	650
16	56-116-AA	36	113	3½	106	21½	15½	48	900
18	56-118-AA	42	126	3½	119	24½	17½	55½	1,200
20	56-120-AA	42	140	4½	131	25½	19	60½	1,350
22	56-122-AA	48	153	4½	144	28½	20½	66½	1,950
24	56-124-AA	54	167	4½	158	31½	22½	72	2,500
26	56-126-AA	54	179	4½	170	31½	23½	85	2,750
28	56-128-AA	60	193	4½	184	34½	25½	87	3,400
30	56-130-AA	66	206	4½	197	37½	27½	95	4,650

Sizes 1"–6" use URB Series (page 2.7)

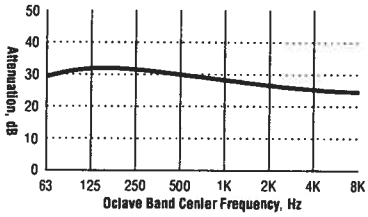
Note: Dimensions and weights are nominal and may vary slightly with production models.
Request certified drawings of specific models for exact dimensions.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Specifications
URB Group
URD Group

Chamber Type Discharge Silencer

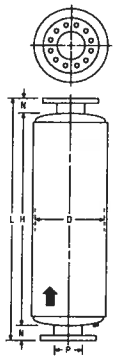
Typical Attenuation Curve



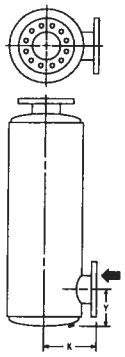
Note: Sizes 1"–6" are URB Series; sizes 8"–30" are URD Series. Both series are fundamentally the same in design and the performance characteristics are identical.

The URB/URD Series Discharge Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It provides pulse control and silencing for subcritical PLV applications. Sizes 4" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications. Smaller sizes are standard with male threaded pipe nipples. Units sized 4" and 5" are available in either flanged or male pipe threads. Exterior surfaces receive a shop coat of rust-inhibitive primer and may be finish painted in the field if desired. The URB/URD Series is the basic end-in, end-out configuration. A low side inlet version is designated URBY/URDY Series; high side inlet is designated URDH Series; and low opposed connection is designated URDS Series. The four types are fundamentally alike and performance characteristics are identical. Mounting brackets and other options are available—see page 2.11.

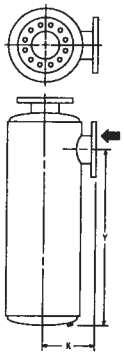
URB, URD Series



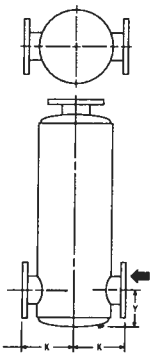
URBY, URDY Series
(Low Side Inlet)



URDH Series
(High Side Inlet)



URDS Series
(Opposed Connections)



Chamber Type Discharge Silencers

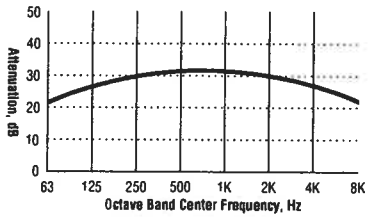
P (Size)	Part Number	D	L	N	H	K	Y URBY, URDY Min	Y URBY, URDY Max	Y URDH Min	Y URDH Max	Y URDS Min	Y URDS Max	Weight
1	55-101-AA	4½	21	2	17	—	—	—	—	—	—	—	10
1½	55-115-AA	6½	24	2	20	—	—	—	—	—	—	—	15
2	55-102-AA	8	33	3	27	7	FIXED AT 6		—	—	—	—	20
2½	55-125-AA	10	34	3	28	8	FIXED AT 7		—	—	—	—	30
3	55-103-AA	10	46	3	40	8	FIXED AT 7		—	—	—	—	40
3½	55-135-AA	12	52	3	46	9	FIXED AT 8		—	—	—	—	55
4	55-104-AA*	14	53	3	47	10	6	22	—	—	8	16	70
5	55-105-AA*	16	65	3	59	11	6½	29	—	—	9	19	120
6	55-106-AA	18	72	3	66	12	8	32	—	—	10	22	160
8	55-108-AA	22	97	3½	90	14½	9	48	62	82	12	29	370
10	55-110-AA	26	122	3½	115	16½	11	63½	76½	106	14	40½	550
12	55-112-AA	30	135	3½	128	18½	12½	69	88	117½	15½	42	800
14	55-114-AA	36	161	3½	154	21½	14½	81	107	141	17½	49	1,250
16	55-116-AA	42	181	3½	174	24½	16½	92½	119½	158½	19½	55½	1,600
18	55-118-AA	48	188	3½	181	27½	18½	98	126½	164½	21½	56½	2,300
20	55-120-AA	48	202	4½	193	28½	19½	103	134	175½	22½	61	2,500
22	55-122-AA	54	204	4½	195	31½	21½	103	137	175½	24½	60	2,950
24	55-124-AA	54	239	4½	230	31½	22½	126	156½	210½	25½	76½	3,450
26	55-126-AA	60	259	4½	250	34½	25	132	175	228	27	78	4,400
28	55-128-AA	66	279	4½	270	37½	27	144	188	246	31	85	6,150
30	55-130-AA	72	304	4½	295	40½	29	161	203	272	32	96	7,250

Note: Dimensions and weights are nominal and may vary slightly with production models. Request certified drawings of specific models for exact dimensions.

*Specify -TT for male pipe threaded units.

∴ See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve



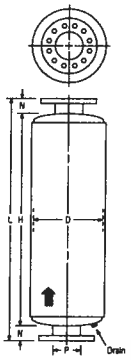
Acoustical packing is suitable for 325°F

Specifications SD Group

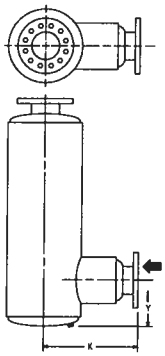
Combination Chamber-Absorptive Type Discharge Silencer

The SD Series Discharge Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It will provide excellent pulse control and is equipped with an acoustically-treated inlet for use on critical PLV applications. Its pulse and noise performance is recommended for all but the most demanding applications, which may require the RD Series on page 2.9. Sizes 4" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications. Smaller sizes are standard with male threaded pipe nipples. Units sized 4" and 5" are available in either flanged or male pipe threads. Exterior surfaces receive a shop coat of rust-inhibitive primer and may be finish painted in the field if desired. The SD Series is the basic end-in, end-out configuration. A low side inlet is designated the SDY Series; high side inlet, SDH Series; and low opposed connection, SDS Series. The four types are fundamentally alike and performance characteristics are identical. Mounting brackets and other options are available—see page 2.11.

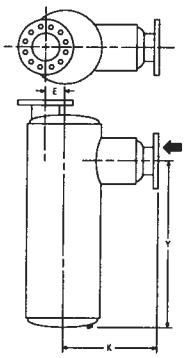
SD Series



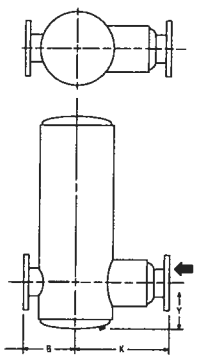
SDY Series
(Low Side Inlet)



SDH Series
(High Side Inlet)



SDS Series
(Opposed Connection)



Combination Chamber-Absorptive Type Discharge Silencers

P (Size)	Part Number	D	L	N	H	K			B	E	Y						Weight
						SDY	SDH	SDS			SDY		SDS		SDH		
											Min	Max	Min	Max	Min	Max	
1																	
1½																	
2	54-102-AA	8	28½	3	22½	8½	—	—	—	—	—	—	—	—	—	—	15
2½	54-125-AA	8	33	3	27	9	—	—	—	—	—	—	—	—	—	—	25
3	54-103-AA	8	39	3	33	10	—	—	—	—	—	—	—	—	—	—	30
3½	54-135-AA	10	39½	3	33½	11	—	—	—	—	—	—	—	—	—	—	40
4	54-104-AA*	10	45	3	39	12½	14½	14½	8	2¼	7½	16½	7½	9½	30½	32½	50
5	54-105-AA*	12	57½	3	51½	15½	17½	17½	9	2¾	9	23	9	12½	40	43½	80
6	54-106-AA	14	64	3	58	17	20	20	10	3¼	9	25½	10	15½	43½	49	110
8	54-108-AA	18	72	3½	65	21½	26½	26½	12½	4	12	30½	12	16½	49½	54	190
10	54-110-AA	22	85	3½	78	25½	32½	32½	14½	5	13½	37	13½	18	61½	65½	380
12	54-112-AA	26	98	3½	91	29½	38	38	16½	6	15	44	15	24	69	77	550
14	54-114-AA	30	111	3½	104	30	40	40	18½	7½	16½	50	16½	25	81	89½	800
16	58-116-AA	36	137	3½	130	35½	47	47	21½	9½	18½	65	18½	36	96	113½	1,250
18	58-118-AA	42	150	3½	143	41	52	52	24½	11½	20½	70½	20½	40½	104½	124½	1,600
20	58-120-AA	42	176	4½	167	47	62	62	25½	10½	21½	87½	21½	48½	120½	147½	1,900
22	58-122-AA	48	195	4½	186	47	61	61	28½	12½	23½	93½	23½	50½	138½	165½	2,700
24	58-124-AA	48	213	4½	204	55½	72	72	28½	11½	24½	110½	24½	60½	146½	182½	3,000
26	58-126-AA	54	233	4½	224	55	76	76	31½	13½	26	117	26	70	157½	201½	3,900
28	58-128-AA	54	250	4½	241	62	81	81	31½	12½	28½	126½	28½	71½	173½	216½	4,400
30	58-130-AA	60	276	4½	267	68	90	90	34½	14½	29½	139	29½	81	190	241½	5,400

Sizes 1" and 1½" use URB Series (page 2.7)

Note: Dimensions and weights are nominal and may vary slightly with production models.
Request certified drawings of specific models for exact dimensions.

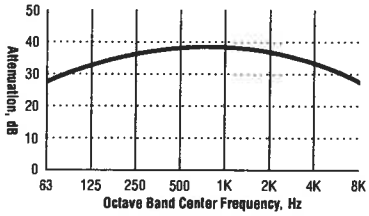
*Specify -TT for male pipe threaded units.

*: See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Specifications RD Group

Combination Chamber-Absorptive Type Discharge Silencer

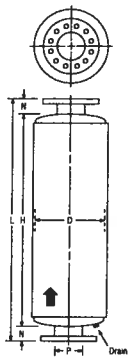
Typical Attenuation Curve



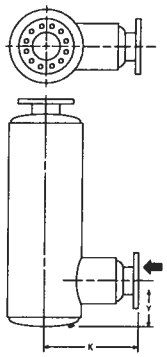
Acoustical packing is suitable for 325˚F

The RD Series Discharge Silencer is a heavy-duty, all welded unit constructed of carbon steel sheet and plate. It provides excellent pulse control and is equipped with an acoustically treated inlet for use on critical PLV applications. Pulse control and noise attenuation provided by the RD Series is the ultimate and is necessary for only the most demanding installations. Sizes 4" and larger are equipped with flanged connections drilled to 125/150 lb ANSI specifications. Smaller sizes are standard with male threaded pipe nipples. Units sized 4" and 5" are available in either flanged or male pipe threads. Exterior surfaces receive a shop coat of rust inhibitive primer and may be finish painted in the field if desired. The RD Series is the basic end-in, end-out configuration. A low side inlet is designated the RDY Series; high side inlet, RDH Series; and low opposed connections, RDS Series. The four types are fundamentally alike and performance is identical. Mounting brackets and other options are available—see page 2.11.

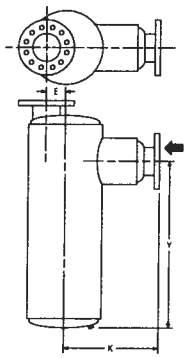
RD Series



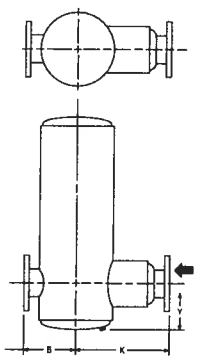
RDY Series
(Low Side Inlet)



RDH Series
(High Side Inlet)



RDS Series
(Opposed Connection)



Combination Chamber-Absorptive Type Discharge Silencers

P (Size)	Part Number	D	L	N	H	K			B	E	Y						Weight
						RDY	RDH	RDS			RDY		RDS		RDH		
											Min	Max	Min	Max	Min	Max	
1																	
1½																	
2	57-102-AA	8	33	3	27	9	—	—	—	—	FIXED AT 6		—	—	—	—	25
2½	57-125-AA	10	34	3	28	10	—	—	—	—	FIXED AT 7		—	—	—	—	35
3	57-103-AA	10	46	3	40	10	—	—	—	—	FIXED AT 7		—	—	—	—	40
3½	57-135-AA	12	52	3	46	11	—	—	—	—	FIXED AT 8		—	—	—	—	60
4	57-104-AA*	14	53	3	47	14½	16	14½	10	4	8	20	8	14	33	39	80
5	57-105-AA*	16	65	3	59	16½	18	16½	11	4½	9	26½	9	16½	43½	51	130
6	57-106-AA	18	72	3	66	20½	22½	20½	12	5	10	30	10	20	46	56	160
8	57-108-AA	22	97	3½	90	24½	28½	26	14½	6	12	45	12	26	65	79	410
10	57-110-AA	26	122	3½	115	28½	34	32	16½	7	14	60½	14	37½	79½	103	600
12	57-112-AA	30	135	3½	128	35	42	39½	18½	8	15½	66	15½	39	91	114½	900
14	57-114-AA	36	161	3½	154	40½	47½	45½	21½	10½	17½	78	17½	46	110	138	1,400
16	57-116-AA	42	181	3½	174	44½	52½	50	24½	12½	19½	89½	19½	52½	122½	155½	1,800
18	57-118-AA	48	188	3½	181	47	54	52½	27½	14½	21½	95	21½	53½	129½	161½	2,550
20	57-120-AA	48	202	4½	193	53½	65	63½	28½	13½	22½	100	22½	58	137	172½	2,750
22	57-122-AA	54	204	4½	195	59½	72	70	31½	15½	24½	100	24½	57	40	172½	3,300
24	57-124-AA	54	239	4½	230	66	81½	79½	31½	14½	25½	123	25½	73½	159½	207½	3,850
26	57-126-AA	60	259	4½	250	72	87	85	34½	16½	27	130	27	76	177	226	5,000
28	57-128-AA	66	279	4½	270	78	93½	91	37½	18½	31	140	31	81	192	242	6,950
30	57-130-AA	72	304	4½	295	78	95½	94	40½	20½	32	158	32	93	205	266	8,100

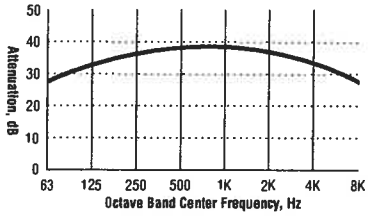
Sizes 1"–1½" use URB Series (page 2.7) or use U5 Series: (page 3.2)

Note: Dimensions and weights are nominal and may vary slightly with production models.
Request certified drawings of specific models for exact dimensions.

*Specify -TT for male pipe threaded units.

∴ See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve



Specifications SURS Group

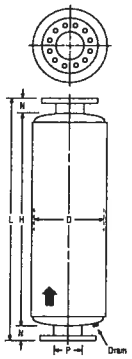
Chamber Type Multi-Use Silencer

SURS Series blower silencers are heavy-duty, all welded steel construction, suitable for application as either and inlet or discharge silencer on rotary positive. These units are designed for blowers running above critical transition speed, and therefore, no acoustic packing material is included in the design. Instead, these units have a specially designed, high-performance, three chamber system which incorporates a diffuser on the blower side of the silencer units. The unit will provide excellent pulse control and is designed for the most demanding applications.

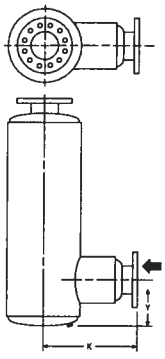
Sizes smaller than four inches are equipped with standard male threaded pipe nipples, while the 4" and larger units have flanged connections drilled to 125/150 lb ANSI specifications. As with other blower silencers, the SURS Series employs a high-heat aluminum paint system.

The SURS is a basic end-in, end-out configuration. A low-side inlet model is designated as the SURSY Series; the SURSY is fundamentally identical to the SURS series in both dimension and attenuation performance. Both series are designed to operate at pressures to 15 psi. Mounting brackets, shell lagging and other accessories are available for both series of blower silencers.

SURS Series



SURSY Series
(Low Side Inlet)



Combination Chamber Type Multi-Use Discharge Silencers

SURS		SURSY		P	D	L	N	H	Y			
Model	Part	Model	Part						K	Min.	Max	Weight
SURS-2	55-A02-SS	SURSY-2	55-B02-SS	2	12	40	3	34	9	4½	13	55
SURS-2.5	55-A25-SS	SURSY-2.5	55-B25-SS	2½	12	40	3	34	9	4½	13	55
SURS-3	55-A03-SS	SURSY-3	55-B03-SS	3	12	46	3	40	9	5	15	60
SURS-3.5	55-A35-SS	SURSY-3.5	55-B35-SS	2½	14	59	3	53	10	5½	20	90
SURS-4	55-A04-SS*	SURSY-4	55-B04-SS†	4	14†	59	3	53	10	6	20	100
SURS-5	55-A05-SS*	SURSY-5	55-B05-SS†	5	16†	71	3	65	11	7	25	160
SURS-6	55-A06-SS	SURSY-6	55-B06-SS	6	18	72	3	66	12	8	25	200
SURS-8	55-A08-SS	SURSY-8	55-B08-SS	8	26	111	3½	104	16½	10	41	520
SURS-10	55-A10-SS	SURSY-10	55-B10-SS	10	30	136	3½	129	18½	12	51	810
SURS-12	55-A12-SS	SURSY-12	55-B12-SS	12	36	138	3½	131	21½	14	50	1,130
SURS-14	55-A14-SS	SURSY-14	55-B14-SS	14	36	168	3½	161	21½	16	63	1,400
SURS-16	55-A16-SS	SURSY-16	55-B16-SS	16	42	181	3½	174	24½	18	51	1,800
SURS-18	55-A18-SS	SURSY-18	55-B18-SS	18	48	188	3½	181	27½	20	48	2,500
SURS-20	55-A20-SS	SURSY-20	55-B20-SS	20	48	214	4	205	28½	22	56	2,850

*Specify -TT for male pipe threaded units.

∴ See pages 1.1–1.3 for ordering information | www.universalsilencer.com

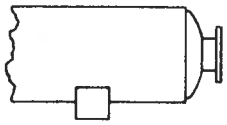
Accessories and Optional Features

UCI, RIS, ICD IRB, IRD, SD, RD, and SURS Blower Silencers

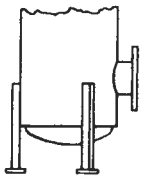
In addition to the standard accessories shown here, other special features such as special materials and finishes will be quoted on request. Contact Universal Silencer with your specific requirements.

Mounting Brackets

Mounting Brackets or legs are available for any of the silencers in this section. Saddle type brackets for horizontal mount and angle legs for vertical mount are standard. See Spec. Sheet No. 1078. Special design brackets will be quoted with your specifications.



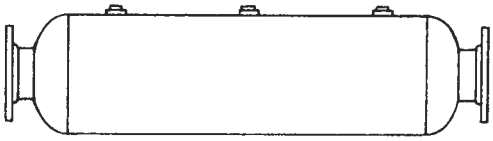
Horizontal

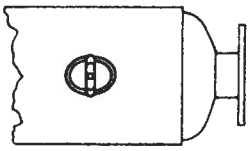


Vertical

Pressure Vessel Construction

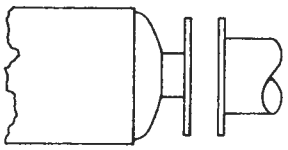
All silencers shown in this catalog may be fabricated in accordance with Div. 1, Section VIII—ASME Code for Unfired Pressure Vessels. Dimensions are similar to standard models, but material types and thicknesses are selected to meet code requirements. Prices are quoted on application to meet your pressure and temperature conditions.





Inspection Openings

Inspection Openings with bolted and gasketed cover plates are available installed at the time the silencer is fabricated. They are designed to withstand the usual range of pressure encountered with blowers. One inspection opening is usually installed in each silencer chamber for cleaning or inspection. Standard sizes include: 3"× 4", 4"× 6", 6"× 8".



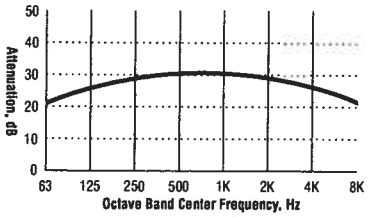
Oversize Flanges

Frequently the blower flange size is larger than the required silencer's connection. Rather than use a larger silencer, it is usually more economical to use an oversize reducing flange on the silencer. This is the conventional piping practice and may be used on either inlet or discharge silencers. Example: a 10" flange size silencer has adequate capacity for a blower with a 12" discharge flange. A flange having a drilling pattern to match the 12" blower flange but with a 10" bore to match the silencer nozzle is substituted on the silencer inlet.

Two pipe sizes, (e.g. 10" to 14"), is the recommended maximum variation. Prices on request.

∴ See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve



CBF/CBFI Series

Compact Blower Inlet Filter-Silencer

Filter and silencer combined in one unit. The CBF and CBFI have the acoustic capabilities of the Universal Silencer RIS Series silencers and the filtration performance of CC series filters.

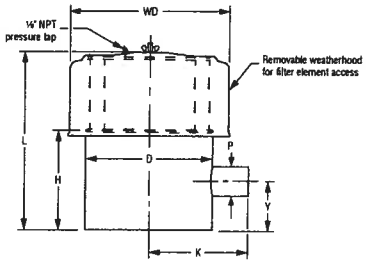
Reduced cost, overall package size, weight, storage space, freight cost and damage.

Approximately one third the size of conventional blower silencer, with the added benefit of excellent, high-efficiency filtration.

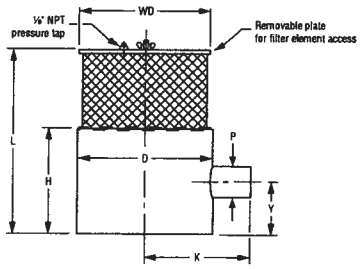
Reduced overall package noise without further acoustic treatment.

Versatile—Suitable for inlet applications in confined areas, outdoor or indoor, without compromising acoustic or pressure drop performance.

CBF Series (outdoor use)



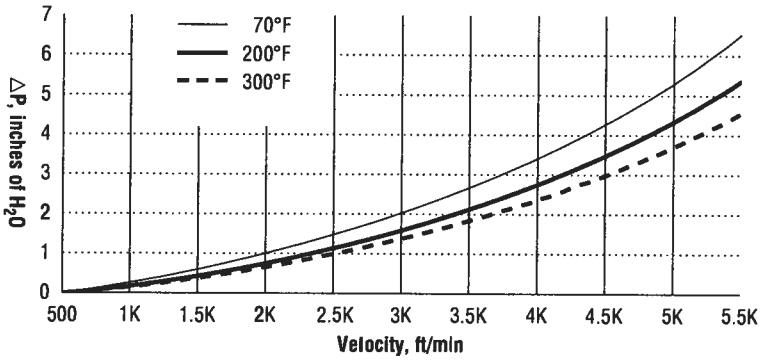
CBFI Series (indoor use)



P (nom.)	Element Part Number		
	Paper	Felt	Wire
2	81-0471*	81-1203*	81-1036*
2½	81-0471*	81-1203*	81-1036*
3	81-1063	81-1205	81-1038
4	81-1063	81-1205	81-1038
5	81-0475	81-1207	81-1040
6	81-0475	81-1207	81-1040
8	81-1163	81-1209	81-1200
10	81-1163	81-1209	81-1200
12	81-1164	81-1210	81-1201

*Pair of elements required (stacked).

Pressure Drop Curves



Models, Dimensions, Weights and Elements

P (nom.)	CBF/CBFI D	H	Y	K	CFM CAP	CBF Part	WD	L	Weight	CBFI Part	B	L_1	Weight
2	8	8	4	7	120	34-702-AA	10	13¼	20	34-G02-AA	6½	12¾	20
2½	8	9	4¾	7	175	34-725-AA	10	14¾	25	34-G25-AA	6½	14¼	25
3	12	10	5¼	9	275	34-703-AA	16	17	50	34-G03-AA	10	16½	50
4	12	15	7½	9	500	34-704-AA	16	21¼	60	34-G04-AA	10	20¾	60
5	16	17	8½	11	750	34-705-AA	20	26	85	34-G05-AA	12	25¼	85
6	16	23	11½	11	1,100	34-706-AA	20	32	100	34-G06-AA	12	31¼	100
8	24	24½	13¾	15½	2,200	34-708-AA	30	39	200	34-G08-AA	12	39¼	185
10	30	35½	17¾	18½	3,000	34-710-AA	36	46½	305	34-G10-AA	18	45¾	295
12	34	39½	19¾	20½	4,300	34-712-AA	40	54½	385	34-G12-AA	24	53¾	370

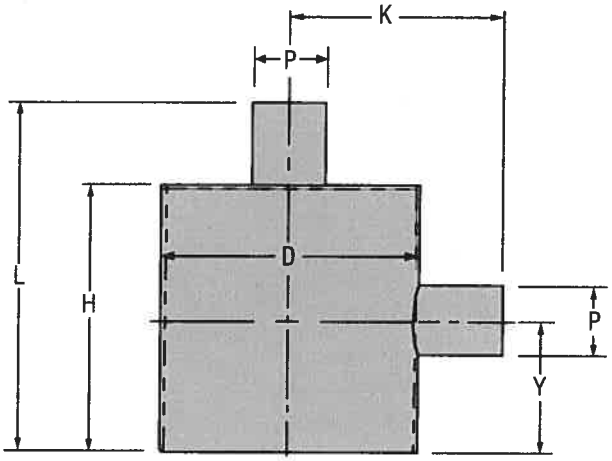
Notes: 1. Non-ASME Code construction suitable for 15" Hg vacuum.
2. Weights are approximate and do no include the weight of the filter element.

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

CB Series

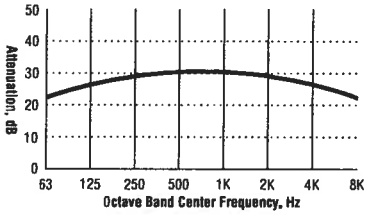
Compact Blower Silencer

This extremely compact blower silencer works as either an inlet or discharge silencer on rotary positive blowers. It is about one-third the size of a standard silencer, and reduces overall package size, cost, weight and storage space. The unit's internal pack material is suitable for temperatures up to 325 degrees. The unit is operable in conditions up to 15 psig. Flanged or threaded connections are available. Exterior surfaces receive a shop coat of rust inhibitive primer.

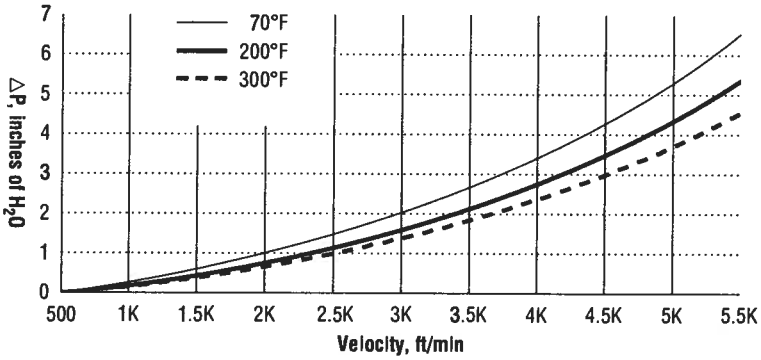


See pages 1.1–1.3 for ordering information | www.universalsilencer.com

Typical Attenuation Curve



Pressure Drop Curves



Compact Blower Silencers

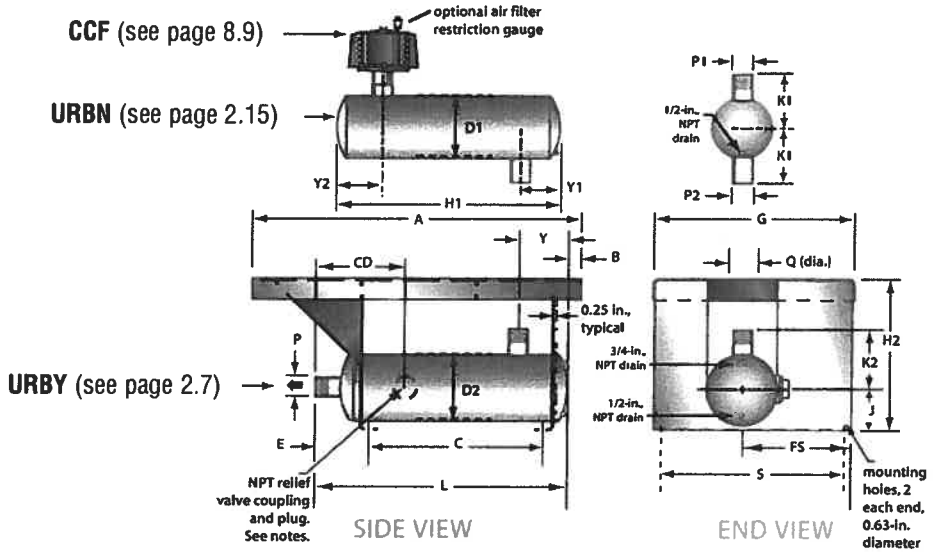
Model	Part Number	P (nom.)	D	L	H	Y	K	Weight	CFM CAP
CB-2	56-702-AA	2	8	11	8	4	7	15	120
CB-2½	56-725-AA	2½	8	12½	9½	4¾	7	25	187
CB-3	56-703-AA	3	12	13½	10½	5¼	9	35	270
CB-4	56-704-AA	4	12	18	15	7½	9	45	480
CB-5	56-705-AA	5	16	20	17	8½	11	70	750
CB-6	56-706-AA	6	16	26	23	11½	11	85	1,080
CB-8	56-708-AA	8	24	31	27½	13¾	15½	170	1,920
CB-10	56-710-AA	10	30	39	35½	17¾	18½	275	3,000
CB-12	56-712-AA	12	34	43	39½	19¾	20½	355	4,320

These wide base plate products accommodate a variety of blower package designs. The UNI-BASE package and the USI-BASE base plate use the same basic base plate and discharge silencer. The UNI-BASE package includes the Universal Silencer model URBN high-side inlet silencer and CCF inlet air filter, while the UNI-BASE base plate is only the basic plate and the URBY discharge silencer. Please see page 2.7 for performance and sizing information for the URBY series silencers, page 2.15 for information on the URBN series silencers, and page 8.9 for performance data, weights and dimensions of CCF filters.

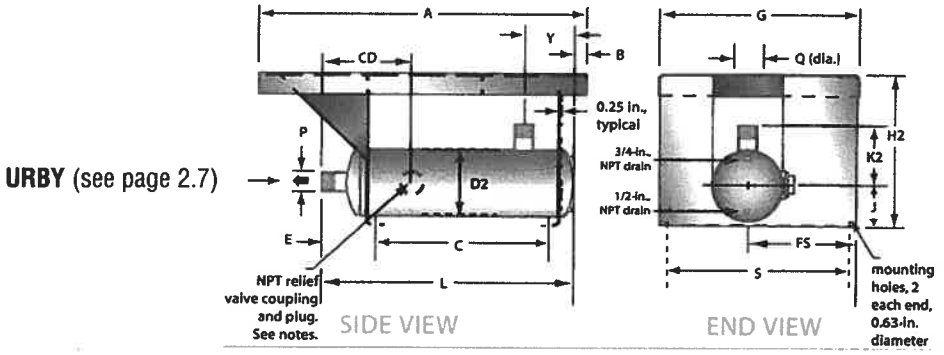
UNI-BASE Ultra-Wide Base Plates/Components

Rotary Positive Blowers

UNI-BASE Package



UNI-BASE Base Plate Only



UNI-BASE Base Plates/Components Part Numbers

Size	UNI-BASE Package	Base Plate Only	URBN Only	URBY Only	CCF Only
2"	80-1873	55-202-ABP	55-502-AA	55-202-AA	34-L02-TT*
2½"	80-1874	55-225-ABP	55-525-AA	55-225-AA	34-L25-TT*
3"	80-1875	55-203-ABP	55-503-AA	55-203-AA	34-L03-TT*
4"	80-1876	55-204-ABP	55-504-AA	55-204-AA	34-L04-TT*
5"	80-1877	55-205-ABP	55-505-AA	55-205-AA	34-L05-TT*
6"	80-1878	55-206-ABP	55-506-AA	55-206-AA	34-L06-TT*

* See pages 1.1–1.3 for ordering information | www.universalsilencer.com

UNI-BASE Ultra-Wide Base Plates/Components

Rotary Positive Blowers

Dimensions and Weights

UNI-BASE Base Plate (w/URBY)

P (nom.)	A	B	C	CD	D2	E	FS	G	H2	J	K2	L	Q (Dia.)	S	Y	Approx. Weight
2	39	1½	20¾	10.56	8	6.31	13	23.38	16	5	7	30	3½	21	6	125
2½	44½	½	20.88	11.13	10	6.56	14¼	27.38	17	6	8	31	4	25	7	170
3	55½	4	31½	12.00	10	7½	15.13	29¾	17	6	8	43	4¾	26¼	7	270
4	56	—	37.31	15.38	14	7.88	16.44	33	24½	8	10	50	6	29¾	11	355
5	66	—	43.38	18¼	16	13¾	14¾	35	23½	9	11	62½	11	30½	12	500
6	66	—	52	18¼	18	10.38	15.13	35¼	26½	10¼	12	69	12	30½	12	645

Notes: 1. Sizes 2"–3" URBY discharge silencers are shipped standard with male pipe threaded connections. 4" and 5" URBY discharge silencers are shipped standard with male pipe threaded discharge connections and plain pipe blower connections. 6" URBY discharge silencers are shipped standard with flanged discharge connection drilled to 125/152 lb. ANSI specifications and plain pipe blower connections.
2. Sizes 2"–3" URBY discharge silencers have a 2" NPT relief valve coupling and plug. Sizes 4"–6" URBY discharge silencers have a 3" NPT relief valve coupling and plug.
3. UNI-BASE base plate kit sizes 2"–4" require gussets.

URBN Silencers

P1/P2 (nom.)	D1	H1	K1	Y1	Y2	Approx. Weight
2	8	27	7	6	3½	25
2½	10	28	8	7	4½	35
3	10	40	8	7	4½	50
4	14	47	10	6	5½	80
5	16	60	11	6	6½	140
6	18	66	12	8	7½	170

Notes: 1. Sizes 2"–4" URBN inlet silencers are shipped with male pipe threaded inlets and plain pipe outlets. Sizes 5" and 6" URBN inlet silencers are shipped standard with flanged inlet connections drilled to 125/150 lb ANSI specifications and plain pipe outlets.

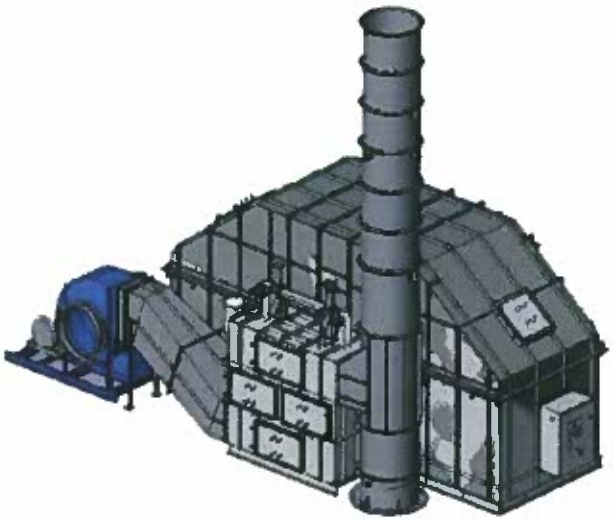
CCF Silencers (please see page 8.9)

See pages 1.1–1.3 for ordering information | www.universalsilencer.com

APPENDIX C RTO Cut Sheets

Anguil Environmental Systems, Inc. Regenerative Thermal Oxidizer

Date: April 25, 2011
Proposal #: AES-119590



Prepared for:

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"Our goal is to provide solutions today which help our customers remain profitable tomorrow"
– Gene Anguil / Founder and CEO








Background:
- Founded in 1978
- Second generation family owned and operated
- Headquartered in Milwaukee, WI, USA with offices in Asia and Europe
- Over 1,650 oxidizers and countless heat recovery systems installed on six continents in a wide variety of industries

Company Size and Make-up:
- Annual sales in excess of $25 million
- In-house engineering staff consists of chemical, mechanical and electrical engineers
- Highly motivated employees who enjoy profit sharing and a rewarding work environment

What Makes Anguil Unique?
- Regulatory compliance is guaranteed
- Broad range of technology solutions that ensure an unbiased equipment selection
- Quality assurance program with complete factory acceptance testing prior to shipment
- An established safety program with continuous training for Anguil technicians
- Equipment is designed in Solidworks, ensuring accuracy and rapid completion

Products:

Air pollution control systems...
- Regenerative Thermal Oxidizers (RTO)
- Catalytic, Recuperative and Direct-Fired Thermal Oxidizers
- Concentrator systems
- Permanent Total Enclosures

...for VOC, HAP and odor abatement

Heat and energy recovery systems...
- Air-to-air heat exchangers
- Air-to-liquid heat exchangers
- Heat-to-power
- Energy Evaluations

...for improved efficiency and reduced operating costs

Aftermarket:

Service and Maintenance...
- 24/7 Emergency service response
- Operating cost reviews
- System upgrades and retrofits
- Spare parts and component packages
- Preventive Maintenance Evaluations (PME)

... on any make or model, regardless of original manufacturer

Partial List of Satisfied Customers:

Boeing, Dow Chemical, Northrop Grumman, ExxonMobil, Johnson and Johnson, Peterbilt, Qualcomm, Rexam Beverage, Silgan Containers, Wyeth

Table of Contents

Executive Summary

1. Equipment Description

URS Corporation has requested a proposal for the collection and destruction of VOCs from an air stripper. THE VOCs will be routed to a new Anguil Regenerative Thermal Oxidizer (RTO). The RTO is designed with high thermal efficiency to minimize operating cost.

2. Facility to be Controlled

Roxana, IL

3. Processes Controlled

Air stripper

4. RTO Energy Recovery

95% Thermal Energy Recovery to minimize gas usage

5. Proposed Equipment

Model 50 (5,000 SCFM) Regenerative Thermal Oxidizer (RTO)
Model 100 (10,000 SCFM) Regenerative Thermal Oxidizer (RTO)

6. Anguil Benefits

* Seamless integration with the current process
* Fully automated PLC based controls
* Modem for remote diagnostics
* Field Tested and proven technology
* Full equipment warranty
* Factory test prior to shipment
* 24 hour service support

7. Results

* Anguil guarantees the conversion efficiency of the 99% or an outlet concentration of 20 ppmv as C1 (methane), whichever is less stringent per EPA Method 25A.

Customer Process Specifications

- Process Flow: 5,000 – 10,000 SCFM
- Process Temperature: 60°F
- VOC Concentration: 10,000 ppm (to be diluted to less than 25% LEL)
- VOCs*: Benzene

* Assumed no halogenated, chlorinated or sulfur bearing compounds are present.

- Facility Power: 460V / 60 Hz / 3 Ph
- Fuel Source: Natural Gas
- Process Water Content: Assumed to be no more than 0.01 lb water / lb air
- Process Oxygen Content: Assumed to be at least 18%
- Process Particulate: Assumed to be negligible
- Performance Requirements: 99%
- RTO location on Site: Outdoors

Note: Equipment has been designed and sized based on these customer parameters.

Design Specifications

	RTO 50	RTO 100
Size and Weight		
• Maximum Airflow:	5,000 SCFM	10,000 SCFM
• Approximate Footprint:	23' 6" x 17'	35' x 17'
• Approximate Weight:	40,000 lbs	65,000 lbs
• Stack Height:	30'	30'
• Stack Diameter:	22"	30"
• Oxidizer Control Panel Location:	Indoors within 50' of oxidizer	
• Suggest Foundation Size:	30' x 20'	41' x 20'
Utilities Required		
• Fuel Requirements:	5 psig 1,500 scfh	5 psig 3,000 scfh
• Electrical Power:	460V / 60 Hz / 3 Ph 48.3 FLA	88.1 FLA
• Required Compressed Air:	80-100 psig (-40°F dewpoint) 5-10 SCFM	
Operation Information		
• VOC Destruction Efficiency:	98% or an outlet concentration of 20 ppmv as C1 (methane), whichever is less stringent per EPA Method 25A.	
• Nominal Heat Transfer Efficiency:	95%	95%
• System Process Fan Draft Design:	Forced	Forced
• System Process Fan HP:	30 HP	60 HP
• Combustion Fan HP:	3 HP	3 HP
• Burner Installed Maximum Capacity:	1.5 MM BTU/hr	3.0 MM BTU/hr
• Operating Set Point:	1550-1700°F	1550-1700°F

***Note: All weights, dimensions, horsepower ratings, burner sizing, and specific engineering details within the proposal are approximate and will be confirmed by Anguil Environmental following order placement.**

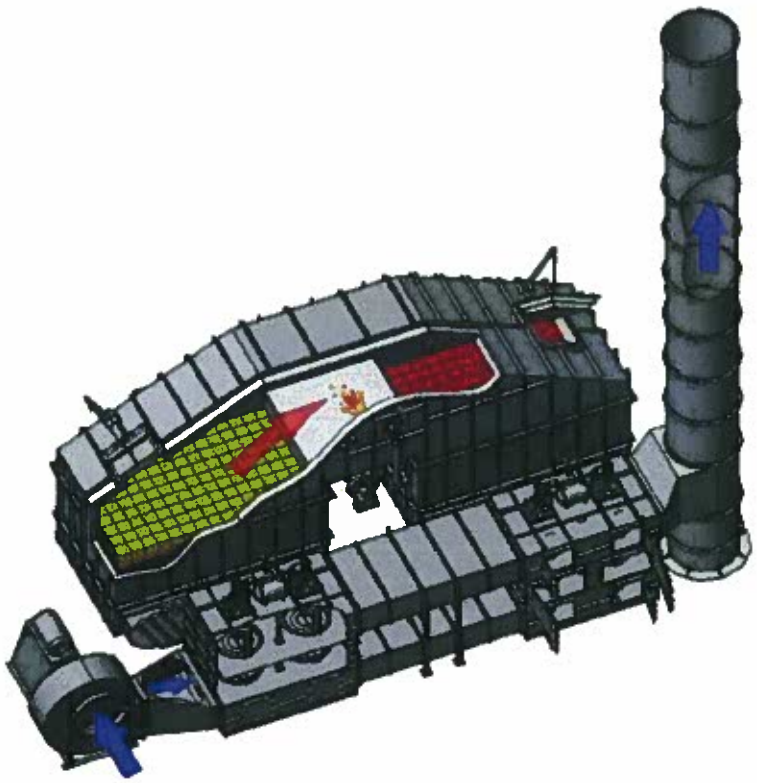
Standard Equipment Specifications

The Anguil Regenerative Thermal Oxidizer (RTO) destroys Hazardous Air Pollutants (HAPs), Volatile Organic Compounds (VOCs) and odorous emissions that are discharged from industrial processes. Emission destruction is achieved through the process of high temperature thermal or catalytic oxidation, converting the pollutants to carbon dioxide and water vapor while reusing the thermal energy generated to reduce operating costs.

How the RTO Works-

VOC and HAP laden process gas enters the oxidizer through an inlet manifold to flow control, poppet valves that direct this gas into energy recovery chambers where it is preheated. The process gas and contaminants are progressively heated in the ceramic media beds as they move toward the combustion chamber.

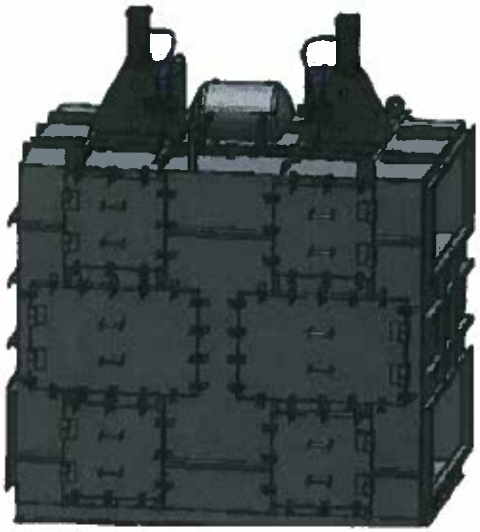
Once oxidized in the combustion chamber, the hot purified air releases thermal energy as it passes through the media bed in the outlet flow direction. The outlet bed is heated and the gas is cooled so that the outlet gas temperature is only slightly higher than the process inlet temperature. Poppet valves alternate the airflow direction into the media beds to maximize energy recovery within the oxidizer. The high energy recovery within these oxidizers reduces the auxiliary fuel requirement and saves operating cost. The Anguil oxidizer achieves high destruction efficiency and self-sustaining operation with no auxiliary fuel usage at concentrations as low as 3-4% LEL (Lower Explosive Limit).



POPPET VALVES

Anguil's poppet valves are uniquely designed to divert high volume process air into and out of the oxidizer, properly balance VOC loading, maintain destruction efficiency and optimize heat recovery. We custom design, manufacture and install these vital components to ensure reliability and trouble free operation. Anguil has several poppet assemblies that have been operating continuously since 1993 and have required nothing but regular maintenance.

SPECIFICATIONS



- Stainless Steel Shaft, Carbon Steel Disk & Seat
- Poppet Box Body: 3/16" Plate Steel
- Cylinder Actuator Supports: 1/4" Plate Steel
- Parker Hannifin Heavy Duty Pneumatic Cylinder: 90 psi, 10 CFM, -40°F
- Heavy Duty, High Flow, 4-way Parker Hannifin Solenoid Valve
- Bolted Actuator Mountings with Shaft Guarding
- Connecting Duct Work to Fan and Exhaust Stack
- Compressed air Accumulator Tank Included
- End of Stroke Switches
- Solenoid Valve Exhaust Flow Control

FEATURES

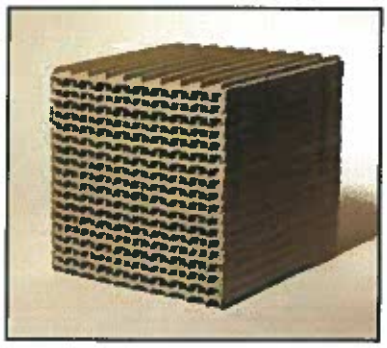
- Vertical Shaft
- Double Acting, Three-way Air Flow Design:
- Reliable Metal to Metal Seal: 1MM+ cycles
- Removable Machined Seats: <0.25% leakage at 18" W.C.
- Valve Pressure Drop: Maximum of 2" W.C.
- Rectangular Ports for Inlet/Outlet Ducting
- Removable Actuator Mounting
- Hinged Access Doors
- Lockout Device with Padlock Provision
- Quiet Operation
- Over Temperature Protection
- Short valve switch distance

ADVANTAGES

Energy Efficient – Compressed air consumption to switch solenoids from closed to open position is minimal
Dependable – Two-disc system minimizes valve switch distance and wear
Ease of Maintenance – Multiple hinged access doors make occasional cleaning and bearing maintenance easy

HEAT TRANSFER MEDIA

- Two (2) beds of high temperature structured heat transfer media and ceramic saddles
- Both elements are chemically and thermally stable for rapid heat up and cool down
- Ceramic media designed to provide optimum heat transfer surface area
- Media bed for proper air distribution and optimum RTO performance
- Low system designed pressure drop



BURNER(S)/FUEL TRAIN

The burner installed capacity is higher than required during normal operation. This allows the system to respond rapidly to significant airflow increases, preventing loss of proper RTO operation temperatures. The burner capacity is also sufficient to maintain system operating temperature during full airflow, VOC free conditions.

- Maxon Kinemax low NOx burner
- Fuel Train fabricated to FM Global specifications
- Service platform and ladder
- 3" burner view port
- Fireye flame safety control with self-checking dynamic UV scanner

COMBUSTION AIR FAN

- Twin City Fan, New York Blower or equal
- Pre-piped and pre-wired
- TEFC motor
- Inlet filter
- Independent controlled fuel and combustion air valves

FRESH AIR/PURGE DAMPER

- Used during oxidizer start-up, shut down or purging during idle time
- Allows for safe start-up and shut-down on ambient air
- Fresh air/purge damper is also used if dilution air is required during periods of high VOC loading or low process flow. The damper is controlled by a signal from the PLC.

RTO SYSTEM FAN

The system fan is sized for -1 in. W.C. at the RTO inlet. This is equivalent to 100' of ductwork, with two elbows and 2500 fpm maximum velocity from T-dampers to oxidizer inlet. Any additional ductwork, elbows or duct velocity may affect fan selection.

- Twin City Fan, New York Blower or equal
- VFD rated motor
- Flexible connection on inlet/outlet of fan

SYSTEM CONTROLS

The system controls are located in a NEMA 12 control panel enclosure. In the event of a system shutdown, the touch screen will indicate the cause of the shutdown via a digital message in English.

- NEMA 12 control panel enclosure to be mounted in a temperature controlled environment (85°F)
- Allen Bradley Logix family PLC (Programmable Logic Controller) controls
- Allen Bradley 10" Color Touchscreen HMI
- Digital chart recorder: monitors combustion chamber and exhaust stack temperatures
- Ethernet modem for remote diagnostics and service support

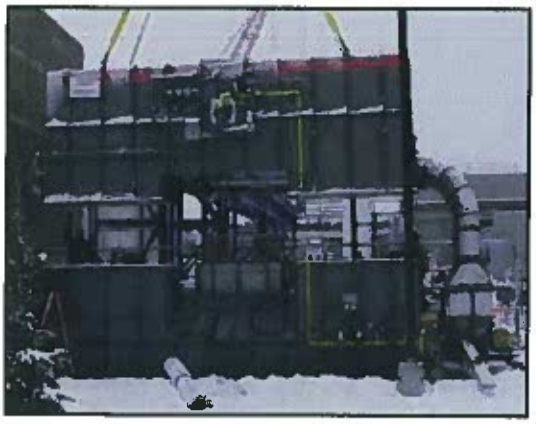
VARIABLE FREQUENCY DRIVE (VFD)

The variable frequency drive regulates the airflow through the system. It is controlled by a pressure transmitter located up-steam from the system fan. The VFD is mounted with the system controls in the control enclosure. It aids in minimizing operating cost by providing system fan turn-down during periods of low airflow.

- Mounted in a NEMA 12 enclosure to in a temperature controlled environment (85°F)

ENERGY RECOVERY CHAMBERS

The RTO's energy recovery chambers are rectangular cross-sections constructed of carbon steel. They are reinforced to withstand the pressure requirement of the process air fan and all other applied loads. A carbon steel support structure is also provided to support the oxidizer chambers, media support grid and the ceramic heat recovery media itself. In order to allow for routine inspection of the heat recovery media, cold face and media support grid, two hinged access doors complete with gaskets are included.



- Two (2) carbon steel energy recovery chambers
  - Internally insulated: 6" thick, 8# density ceramic module insulation
  - Insulation rated for 2300°F
  - Insulation modules: shop installed with 310 stainless steel reinforcements and mounting hardware
- Support Structure
- Media support grid
- Two hinged access doors with gaskets

COMBUSTION CHAMBER

The combustion chamber is a rectangular cross-section constructed of carbon steel and reinforced to withstand the pressure requirements of the process air fan and all other applied loads. The inverted "U" shape design provides the retention time to obtain the specified VOC destruction efficiency. In order to allow for routine inspection of the heat recovery media, insulation and burner, two hinged access doors complete with gaskets are included.

- Inverted "U" shaped oxidation chamber
  - Internally insulated: 8" thick, 8# density ceramic module insulation
  - Insulation rated for 2300°F
  - Insulation modules: shop installed with 310 stainless steel reinforcements and mounting hardware
- Hinged access doors with gaskets

EXHAUST STACK

- Constructed of carbon steel / aluminized steel
- Supported by guy wires
- Two (2) EPA tests ports: 90° to each other
- Stack is sandblasted, zinc primed and high temperature coating applied

BAKE OUT

The oxidizer can be operated off-line from the process in a bake-out mode to allow for the removal of organic build-up on the cold face of the heat exchange media. At a reduced airflow, the outlet temperature is allowed to reach an elevated temperature before the flow direction is switched. This hot air vaporizes organic particulate that may have collected on the cold face of the heat exchange media. The flow direction is then switched and the opposite cold face is cleaned. The area below the media support grid will be insulated to prevent the temperature of the outer skin from increasing during bake-out.

PAINTING

All exposed surfaces of the oxidizer shall be primed coated with a high solids epoxy coating. The finish coat shall be a gloss high solids polyurethane multi-function weather resistant coating. The natural gas and compressed air piping will be primed and painted with one (1) coat of Anguil's standard coating. All other equipment will be the manufacturer's standard paint and color. Prior to painting, all welds will be caulked.

- UV resistant polyurethane paint
- Paint color can be specified by the customer

OPERATION & MAINTENANCE MANUALS

- Two (2) hard copy sets of the Operation and Maintenance Manuals (O&M) containing the sequence of operation and drawings
- CD-ROM of all Vendor Bulletins

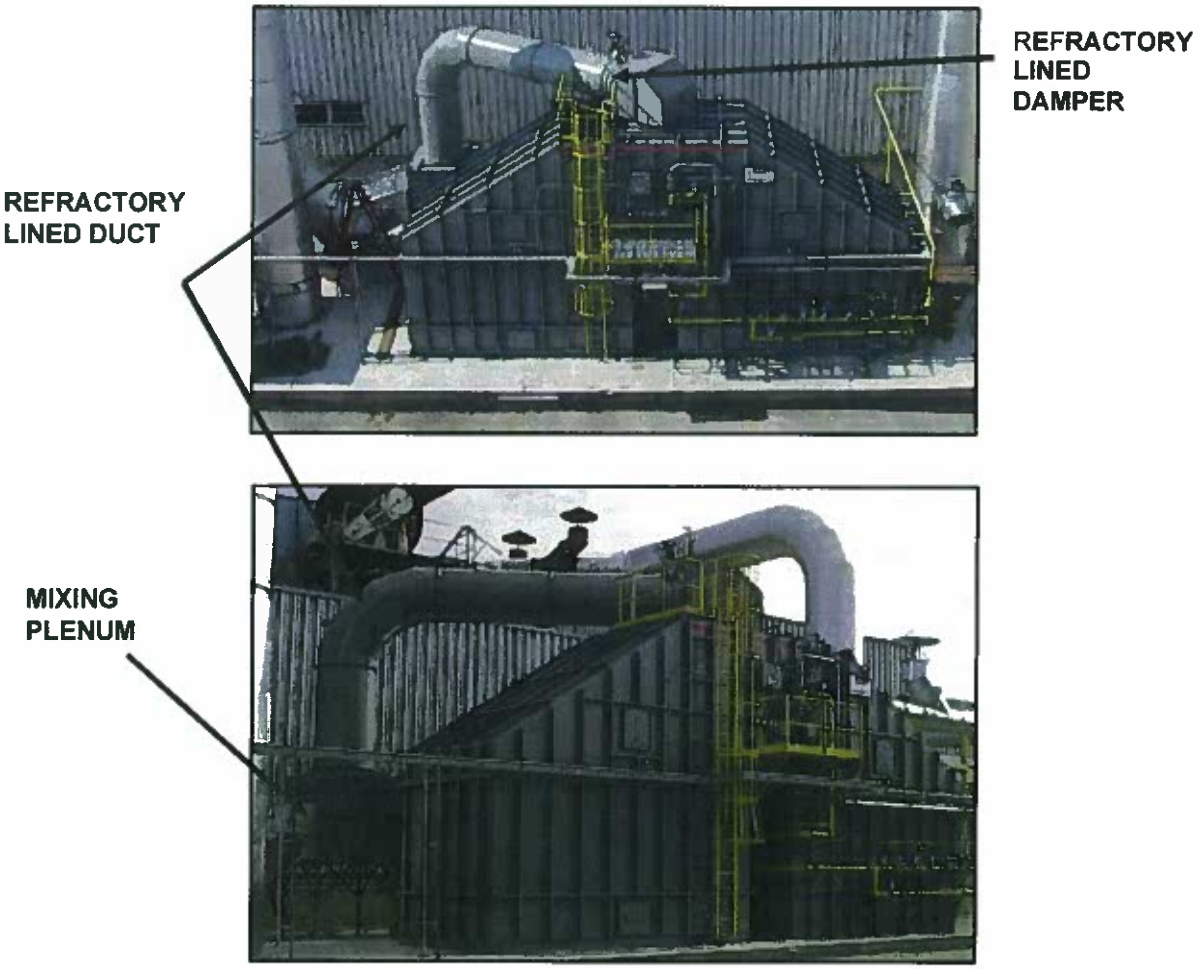
FINAL ASSEMBLY AND SHOP TEST

We pre-assemble and pre-test modular components in our factory to provide significant savings of time and money during installation and start-up. Units are prewired and pre-piped at the factory for improved quality control and trouble-free start-up.

- Temporary assembly of system
- Inspection of the unit for manufacturing quality
- Check fuel and electrical connections
- Starting of burner and fuel train
- Warning labels are installed
- Test ports are installed
- Run electrical rigid conduit
- Fans and motors installed, cleared of debris and checked for quality
- Valves to be cycled and set
- Customer is invited to witness shop testing

HOT SIDE BYPASS

- This bypass will be used during periods of high solvent loading which allows unit to handle high VOC loads
- Hot bypass damper internally lined with hard refractory
- 330 stainless steel shaft and blade
- Damper position controlled by PLC and driven with pneumatic actuator with positioner
- Internally lined bypass duct to mixing plenum
- Duct and valve sized based on maximum temperature of 1800°F
- Hot gas routed in refractory-lined duct to a mixing plenum on grade
- The refractory-lined duct will provide the necessary residence time to achieve the required DRE

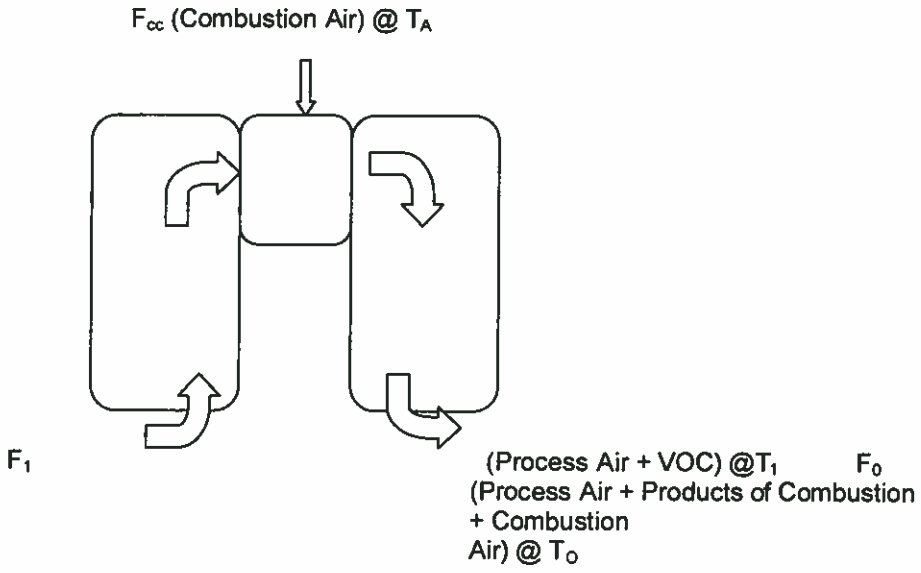


Institute of Clean Air Companies (ICAC) Guidance Method for Estimation of Gas Consumption in an Regenerative Thermal Oxidizer (RTO)

1. OBJECT AND SCOPE

Supplemental fuel consumption, typically natural gas, can be a significant consideration for the installation and operation of a regenerative thermal oxidizer (RTO). Regenerative thermal oxidizers are used in a variety of processes in the destruction of volatile organic compounds (VOC) and hazardous air pollutants (HAP). The amount of fuel required will vary by application; however, within a single application an estimate of fuel consumption should be consistent among RTO manufacturers and suppliers. As a result, the following procedure developed by ICAC and its member companies describes an industry derived guidance method for estimating gas consumption requirements of an RTO. Once fuel consumption has been estimated, fuel as part of the operating cost can be calculated using current or projected fuel cost assumptions. Generally, this method can also be used as a reference to confirm and compare manufacturers' fuel consumption estimates. The guidance method estimate will provide a reference for gas consumption estimates.

2. OVERVIEW OF GAS CONSUMPTION IN AN RTO



3. GUIDANCE ESTIMATION METHOD

Energy consumed in the RTO can be determined by performing a heat balance as follows:

$$Q_T = Q_I + Q_{cc} + Q_{RL} - Q_{VOC}$$

Q_I :Heat used to raise temperature of F_I (BTU/hr)
Q_{cc} :Heat used to raise temperature of F_{CC} (BTU/hr)
Q_{RL} :Radiation Heat loss from RTO (BTU/hr)
Q_{VOC} :Heat Release from oxidation of VOCs (BTU/hr)

$$Q_I = F_I \text{ X } 1.10 \text{ x } (T_O - T_I)$$

$$Q_{CC} = F_{CC} \text{ X } 1.10 \text{ X } (T_O - T_A)$$

$$Q_{VOC} = \text{VOC X } H_C \text{ X } (\% \text{ Dest} / 100)$$

Where:

F_I: Process air (SCFM)
F_{CC}: Combustion air (SCFM)
T_I: RTO inlet air temperature (°F)
T_A: Ambient or Combustion air temperature (°F)
T_O: Average RTO outlet temperature (°F)
1.10: 60 (min/hr) x 0.075 (lb/ft^3, density of air at standard conditions) x 0.245 (Btu/deg F – lb, specific heat of air), where 0.245 is the average heat capacity of air over the temperature range.
VOC: lbs/hr of VOC to the oxidizer
H_C: Weighted Average for Heat of Combustion of VOCs
% Dest: Guaranteed VOC Destruction Rate

Since F_I, F_{CC}, T_I, T_O and T_A can all be determined by data supplied with proposal, Q_I and Q_{CC} can be determined.

To determine Q_{RL} the following guidelines can be used:

1. Determine surface area of the RTO shell
2. Multiply that area by heat loss factor (assume 200 Btu/ft^2) to arrive at approximate Q_{RL}.

4. CALCULATION OF THERMAL EFFICIENCY (*N*)

$$N = ((F_I + F_{CC}) / F_I) \text{ X } ((T_C - T_O) / (T_C - T_I))$$

Where:
N = Thermal Efficiency

T_C = Temperature, Combustion Chamber

T_O = Temperature, RTO Outlet (Average)

T_I = Temperature, RTO Inlet

APPENDIX D PLC Controller and Data Logging Cut Sheets

62000-69000 SERIES POWER DISTRIBUTION BLOCKS

VERSATILE POWER DISTRIBUTION BLOCKS FOR CABLE TERMINATIONS

Ferraz Shawmut Power Distribution Blocks afford a safe, convenient way of splicing cables, splitting primary power into a variety of secondary circuits or providing a fixed junction tap-off point. Power block options include single or dual primary connections with up to 30 secondary connections.

Features/Benefits

- **Adder Poles**
  All series have optional adder poles which snap onto the 1, 2 or 3- pole blocks and lock together to form as many poles as required. Adder poles with a variety of terminations can be combined to match special wire size combinations.
- **Wire Connectors**
  Standard aluminum box connectors accommodate aluminum or copper wire, 1 conductor per opening. Standard copper box connections are for copper wire only, 1 conductor per opening. Connectors are all 1 piece and tin plated.
- **Insulators**
  Insulators are virtually unbreakable, glass-filled polycarbonate on all series. "See-Through" Safety Covers are available which give greater safety and provide Service Entrance ratings for large and intermediate series blocks.

Ratings

- Ampere ratings from 90 to 2660
- 600V rated
- Short Circuit current rating 100kA with proper fuse. Contact technical services for sizing table.

Approvals

- Most sizes are UL Recognized Component - Guide XCFR2, File E73571
- Most sizes are CSA Certified:
  Series 62, 63, 66, 68 - Class 6228,File 69363
  Series 67, 69 - Class 3211, File 15469

HIGHLIGHTS:

- **Mini -** 62000 and 63000 Series
- **Intermediate -** 66000 and 67000 Series
- **Large -** 68000 and 69000 Series

APPLICATIONS:

- Box, stud and quick-connect terminations for copper and/or aluminum cables

MINI 62000-63000 SERIES/POWER DISTRIBUTION BLOCKS

Sizes, Ratings, Catalog Numbers – Mini Series 62000 and 63000

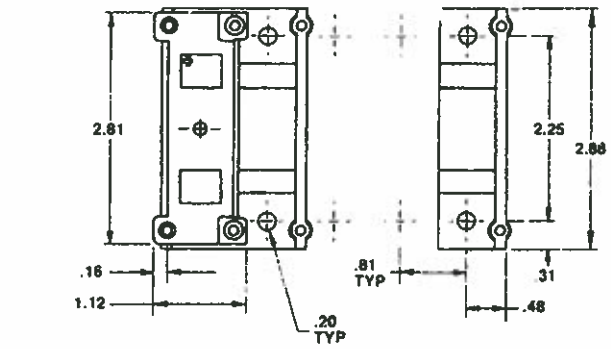
Ampere rating based on NEC Table 310-16 for 75° copper wire.

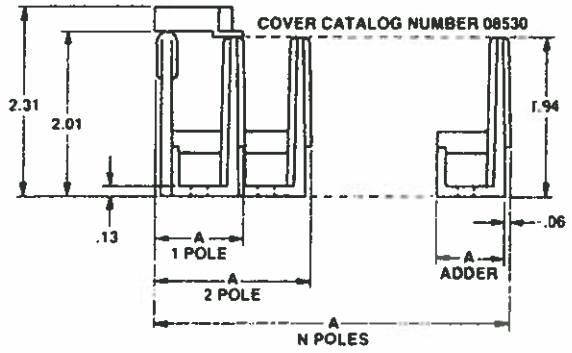
PRIMARY		SECONDARY		AMP RATING		CATALOG NUMBER								SHORT CIRCUIT CURRENT RATING
						ALUMINUM (Connector rated for 90° C Cu/Al wire)				COPPER (Connector rated for 90° C Cu wire only)				
WIRE RANGE AWG/kcmil or STUD SIZE*	OPENINGS or STUDS PER POLE	WIRE RANGE AWG/kcmil or STUD SIZE*	OPENINGS or STUDS PER POLE	CSA	UL	ADDER	1 POLE	2 POLE	3 POLE	ADDER	1 POLE	2 POLE	3 POLE	
Box to Box														
#4-14	1	#4-14	1 4	90	85	63100 63160	63101 63161	63102 63162	63103 63163	62100 62160	62101 62161	62102 62162	62103 62163	• •
2/0-#14	1	2/0-#14 #2-14 #4-14	1 2 4	185	175	63150 63190 63130	63151 63191 63131	63152 63192 63132	63153 63193 63133	62150 62190 62130	62151 62191 62131	62152 62192 62132	62153 62193 62133	• • •
Box to Stud														
2/0-#14	1 1	1/4-20 x 5/8 1/4-20 x 1/2 Tapped hole	1 1	185	175	63140	63141	63142	63143	62140 62170	62141 62171	62142 62172	62143 62173	• •
Stud to Stud														
1/4-20 x 5/8	1	1/4-20 x 5/8	1	240	240	-	-	-	-	62200	62201	62202	62203	•
Box to Quick Connect														
#4-14	1	1/4 x .032DC	4	90	95	-	-	-	-	62210†	62211†	62212†	62213†	-

*Studs are furnished with nuts and washers. Recommended stud torque: (1/4-20) - 72 in. lbs. †Quick connector, not CSA Certified.

Note: Blocks for 5, 6 and 10 poles are also available. To order, simply modify the Adder catalog number. Example: 63100 becomes 63106 for 6 poles.

•Short circuit current rating with correctly sized fuse 100kA except adder block. Contact Ferraz technical services for fuse type and maximum ampere required.





Dimensions – 62000 and 63000 Series Power Distribution Blocks

NUMBER OF POLES	DIMENSION A (Inches)
ADDER	.812
1	1.09
2	1.90
3	2.71
N	(.812 x N) + .273

Example for 10 poles:
A= (.812 x 10) + .273 = 8.39

SAFETY COVER - Catalog number 08530

Polycarbonate safety cover provides dead-front protection to 62000 and 63000 series power distribution blocks. One cover is needed or each pole (1-pole block requires 1 cover, 3-pole requires 3 covers, etc.) Each cover has a test prod hole in the center for circuit checking and each is marked with the reminder "REPLACE AFTER SERVICING EQUIPMENT".

To order, simply determine the total number of poles to be protected and specify the same number of 08530 safety covers. Mounting screws are supplied with cover.

Recommended mounting screws for all 62000-63000 series: #10 (.190" diameter).

END BARRIER - Catalog number U09311

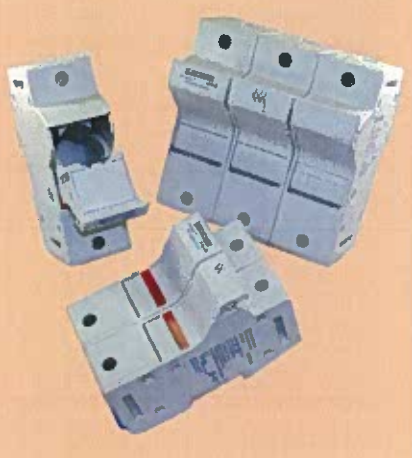
Polycarbonate end barriers snap on to PDB Adder blocks to form 1-pole blocks. Use one barrier per block.

US3J & US6J UltraSafe™ Class J Fuse Holders

UltraSafe™ modular fuse holders for class J fuses

Mersen UltraSafe Modular 600 Volt Fuse Holders for Class J fuses introduce a new level of safety and ease for installing or replacing Class J fuses. UltraSafe holders qualify as "finger-safe" to an IP20 grade of protection under IEC standards. The US3J accommodates 30A Class J or 22 x 58 mm French Ferrule* fuses. The US6J is for 60A Class J fuses. UltraSafe holders are available in compact 1, 2, or 3 pole units, with or without blown-fuse indicators in each pole. Multi-pole units can also be made up in the field by using the multiple-pole Assembly Kits. All units have provisions for locking in the open position for safety during fuse changeouts or equipment servicing. US3J and US6J holders can be snap-mounted to 35 mm DIN-rail and they have a unique latch which will stay open to allow re-positioning of the holder in the future. UltraSafe body material is tough and durable polyamide.

**Holder not UL listed when installed with French Ferrule fuses.*



Ratings:

Volts	: 600VAC/DC
Amps	: US3J - 30A or less
	: US6J - 60A or less
SCCR	: 200kA

Min. voltage to operate indicator light 90VAC, 115VDC [Less than 0.7 mA leakage current at 600V]

Highlights

- Finger-safe IP20 protection
- Optional indicator lights
- DIN-rail mount
- Compact footprint
- Quick, easy fuse change

Applications:

- 600 volt motors, transformers, lighting, heating, control circuits, general loads
- Non-load disconnect

Recommended Fuse Usage:

US3J, US6J use with AJT, A4J, HSJ

Approvals:

- All UltraSafe fuse holders meet the requirements of UL4248 File E52283
- CSA certified class 6225 File 32169
- IEC Certified 269

MERSEN

US3J & US6J UltraSafe™ Class J Fuse Holders

Catalog Numbers

Catalog No. W/O Indicator	Catalog No. W/ Indicator	Description	Fuse Type	Voltage Rating AC	Voltage Rating DC	Ampere Rating	No. of Poles	Certifications
US3J1	US3J1I	1-Pole 30A Class J UltraSafe Fuse Holder	Class J	600V	600V	30A	1	UL Listed CSA Approved IEC Certified
US3J2	US3J2I	2-Pole 30A Class J UltraSafe Fuse Holder					2	
US3J3	US3J3I	3-Pole 30A Class J UltraSafe Fuse Holder					3	
US6J1	US6J1I	1-Pole 60A Class J UltraSafe Fuse Holder				60A	1	
US6J2	US6J2I	2-Pole 60A Class J UltraSafe Fuse Holder					2	
US6J3	US6J3I	3-Pole 60A Class J UltraSafe Fuse Holder					3	

Catalog Numbers – Accessories

Accessories Catalog No.	Description
US3JN	1-Pole Neutral 30A Class J UltraSafe Fuse Holder
US3JPAK	Pin Tie Assembly Kit, 6-Poles, for use with US3J
US6JN	1-Pole Neutral 60A Class J UltraSafe Fuse Holder
US6JPAK	Pin Tie Assembly Kit, 6-Poles, for use with US6J

Additional specifications:

Terminal screws: Phillips/slot head

Suggested screw torque: 30A - 35 in-lbs. 60A - 45 in-lbs

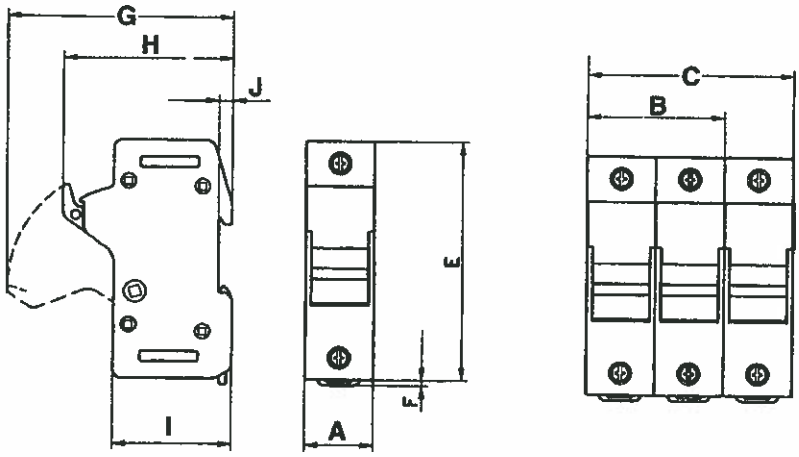
Connector type: Pressure plate

Wire range: #2 to #14 (solid/stranded Cu)

Load-break disconnect: No

Dimensions

Dimension	US3J mm	US3J In	US6J mm	US6J In
A	32.5	1.28	40	1.57
B	65	2.56	80	3.15
C	97.5	3.84	120	4.72
E	114	4.49	122	4.80
F	3	0.12	3	0.12
G	106	4.17	115	4.53
H	80	3.15	89	3.50
I	56	2.20	62	2.44
J	6.5	0.26	6.5	0.26



D1031Q

Products > Series D1000 > Digital Input > D1031Q - 4 Ch, Switch/Proximity Detector Repeater. Transistor Out.

Code: **D1031Q** Products comparison or request a quotation

Name: 4 Ch, Switch/Proximity Detector Repeater. Transistor Out.

Type: Digital Input Show similar products

Suppiy: 12-24 Vdc

Field device: Show similar products

Channels: 4

Description: The D1031Q isolates and repeat four contacts or four proximity detectors in Hazardous Location, with common return, providing four O.C. Transistor outputs to drive Safe Area Loads. The unit can be configured for NO/NC contact or proximity detector inputs and for NO or ND opt coupled open collector transistor output.

Hazardous area: Dry contact, proximity Switch.

Safe area: 1 Open collector per channel plus LED for line fault detection.

Function: 4 channels I.S. switch repeater for contact or EN60947-5-6 Proximity Switches. Provides 3 port isolation (input/output/suppiy).

Features: High density with 4 independent channels.
Field Configurable via Dip-Switches.
10-30 Vdc power suppiy.

Click to enlarge

Datasheet:
- DTS0023 D1031Q English datasheet (PDF 308 KB)
- DTS0074 D1031Q Italiano datasheet (PDF 307 KB)
- DTS0208 D1031Q Русский datasheet (PDF 345 KB)

Instruction manual:
- ISM0009 D1031Q instruction manual (PDF 482 KB)
- ISM0102 Generai D1000 Series Instruction Manual (PDF 2.39 MB)

Certifications:
- CRT003 ATEX DMT 01 ATEX E 042 X (PDF 8.35 MB)
- CRT005 UL & C-UL (PDF 133 KB)
- CRT008 TCCExEE for D1000 Series (Russia) (PDF 492 KB)
- CRT009 TCCExEE for D1000 Series (Ukraine) (PDF 565 KB)
- CRT010 Rostehnadzor for D1000 and T3010 Series (Russia) (PDF 730 KB)
- CRT011 Gosstandard for D1000 Series (Russia) (PDF 10.10 MB)
- CRT012 Gosnadzorohrantruda for D1000 Series (Ukraine) (PDF 168 KB)
- CRT014 Metrologicai Certificate for D1000 Series (Russia) (PDF 202 KB)
- CRT020 FM 3024643 (USA) & FM-C 3029921C (Canada) (PDF 5.95 MB)
- CRT023 DNV Certificate for Ships and Offshore Standards (PDF 1.03 MB)

CRT028 Korean Register Type Approval Certificate (PDF 460 KB)

CRT032 IECEx Certificate for D1000 Series (PDF 1.77 MB)

CRT047 ATEX Certificate D1000 Series by IMQ (PDF 1.02 MB)

CRT053 TCCExEE Expert report for D1000 Series (Ukraine) (PDF 3.05 MB)

Application notes: APN0007 Universal AC Power Supply for Series D1000 (PDF 44 KB)
APN0010 Digital Unit Testing for D1000 Models (PDF 212 KB)

Accessories: BUS Power Bus Optional Enclosure

Various: Conformal Coating Declaration (PDF 55 KB)
D1000 Declaration of Conformity (PDF 153 KB)
Declaration of Conformity - Zone II (PDF 720 KB)
Dichiarazione di Conformità EC (italiano) (PDF 154 KB)
REACh, RoHS Declaration of Conformity (PDF 55 KB)
Russian Language D1000 Series Presentation (PDF 4.53 MB)

News: [Documents] New Company and Products **Catalog**
[Certifications] IECEx Certifications for D1000 Series now available
[Certifications] D1000 Series DNV Certificate for Ships and Offshore

Are you interested in this product? Request a quotation, search for an expert in your area or contact us.

« Previous: D1031D **D1031Q** Next: D1032D »

Home | Products | Download | Contacts | Site map Products: - D1031Q Details

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Contacts

GM INTERNATIONAL
TECHNOLOGY FOR SAFETY

D1031

Switch/Proximity Detector Repeater Transistor Output DIN-Rail Models D1031D, D1031Q

Characteristics:

General Description:
The Switch/Proximity Detector Repeater type D1031 is a DIN Rail unit with two or four independent channels. The unit can be configured for contact or proximity detector, NO or NC and for NO or NC optocoupled open collector transistor output.
Each channel enables a Safe Area load to be controlled by a switch, or a proximity detector, located in Hazardous Area.
D1031Q quad channel type has four independent input channels and actuates the corresponding output transistor. Two actuation modes can be independently DIP switch configured on each input channel: NO input/NC transistor or NO input/NO transistor. Contact or proximity sensor and its connection line short or open circuit fault detection is also DIP switch configurable: fault detection can be enabled (in case of fault it de-energizes the corresponding output transistor and turns the fault LED on) or disabled (in case of fault the corresponding output transistor repeats the input line open or closet status as configured).
D1031D dual channel type has two input channels and four output transistors; the unit has two DIP switch configurable operating modes:
Mode A) input channel actuates in parallel the two output transistors. Transistor actuation mode can be independently configured for each output in two modes: NO input/NC transitor or NO input/NO transistor.
Mode B) input channel actuates output transistor A configurable in two modes as in mode A above. Output transistor B operates as a fault output (in case of input fault, transistor B actuates and the fault LED turns on while transistor A repeats the input line as configured). Actuation can be DIP switch configured in two modes:
No input fault/energized transistor (it de-energizes in case of fault) or
No input fault/de-energized transistor (it energizes in case of fault).

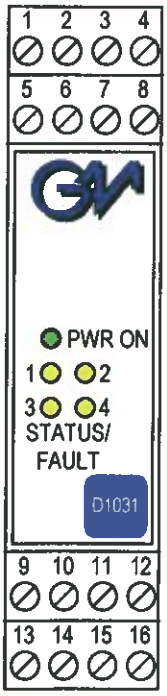
Function:
2 or 4 channels I.S. switch repeater for contact or EN60947-5-6 proximity.
Provides 3 port isolation (input/output/supply).

Signalling LEDs:
Power supply indication (green), output status (yellow), line fault (red).

Field Configurability:
NO/NC input for contact/proximitor, NO/NC transistor operation and fault detection enable/disable.

EMC:
Fully compliant with CE marking applicable requirements.

Front Panel and Features:



- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- NO/NC contact/proximity Detector Input.
- Four opto isolated voltage free Transistor Output Signals.
- Transistor Output for fault detection on dual channel version.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- In-field programmability by DIP Switch.
- ATEX, IECEx, UL & C-UL, FM & FM-C, Russian and Ukrainian Certifications.
- Type Approval Certificate DNV and KR for marine applications.
- High Reliability, SMD components.
- High Density, four channels per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Ordering Information:

Model:	D1031	
2 channels	D	
4 channels	Q	
Power Bus enclosure		/B

Technical Data:

Supply:
12-24 Vdc nom (10 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 50 mA for 4 channels D1031Q, 40 mA for 2 channels D1031D with input closed and transistors energized.
Current consumption @ 12 V: 100 mA for 4 channels D1031Q, 80 mA for 2 channels D1031D with input closed and transistors energized.
Power dissipation: 1.2 W for 4 channels D1031Q, 1.0 W for 2 channels D1031D with 24 V supply voltage, input closed and transistors energized.
Max. power consumption: at 30 V supply voltage, short circuit input and transistors energized, 1.4 W for 4 channels D1031Q, 1.0 W for 2 channels D1031D.

Isolation (Test Voltage):
I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; Out/Supply 500 V; Out 1-3/Out 2-4 500 V.

Input switching current levels:
ON ≥ 2.1 mA, OFF ≤ 1.2 mA, switch current ≈ 1.65 mA ± 0.2 mA hysteresis.
Fault current levels: open fault ≤ 0.2 mA, short fault ≥ 6.8 mA (when enabled both faults de-energize channel transistor with quad channel unit D1031Q or actuate fault transistor with dual channel unit D1031D).
Input equivalent source: 8 V 1 KΩ typical (8 V no load, 8 mA short circuit).

Output:
voltage free SPST optocoupled open-collector transistor.
Open-collector rating: 100 mA at 35 V (≤ 2.0 V voltage drop).
Leakage current: ≤ 50 µA at 35 V.
Response time: 500 µs.
Frequency response: 1 KHz maximum.

Compatibility:
CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

Environmental conditions:
Operating: temperature limits -20 to + 60 °C, relative humidity max 90 % non condensing, up to 35 °C.
Storage: temperature limits – 45 to + 80 °C.

Safety Description:
II (1) G [Ex ia Ga] IIC, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I, II 3G Ex nA II T4, [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I associated electrical apparatus.
Uo/Voc = 10.7 V, Io/Isc = 15 mA, Po/Po = 39 mW al terminals 13-14, 15-16, 9-10, 11-12.
Um = 250 Vrms, -20 °C ≤ Ta ≤ 60 °C.
Approvals:
DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11, EN60079-26, EN61241-0, EN61241-11, IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11, IEC60079-26, IEC61241-0, IEC61241-11, IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-15, UL & C-UL E222308 conforms to UL913 (Div.1), UL 60079-0 (General, All Zones), UL60079-11 (Intrinsic Safety "i" Zones 0 & 1), UL60079-15 ("n" Zone 2), UL 1604 (Div.2) for UL and CSA-C22.2 No.157-92 [Div.1), CSA-E60079-0 (General, All Zones), CSA-E60079-11 (Intrinsic Safety "i" Zones 0 & 1), CSA-C22.2 No. 213-M1987 (Div. 2) and CSA-E60079-15 ("n" Zone 2) for C-UL, refer to control drawing ISM0129 for complete UL and C-UL safety and installation instructions, FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 and C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15, Russia according to GOST 12.2.007.0-75, R 51330.0-99, R 51330.10-99 [Exia] IIC X, Ukraine according to GOST 12.2.007.0,22782.0,22782.5 Exia IIC X, DNV and KR Type Approval Certificate for marine applications.

Mounting:
T35 DIN Rail according to EN50022.
Weight: about 130 g D1031Q, 120 g D1031D.
Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm².
Location: Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4, Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

Parameters Table:

Safety Description	Maximum External Parameters			
	Group Cenelec	Co/Ca (µF)	Lo/La (mH)	Lo/Ro (µH/Ω)
Terminals 13-14, 15-16 9-10, 11-12				
Uo/Voc = 10.7 V	IIC	2.23	172	930
Io/Isc = 15 mA	IIB	15.60	689	3720
Po/Po = 39 mW	IIA	69.00	1379	7440

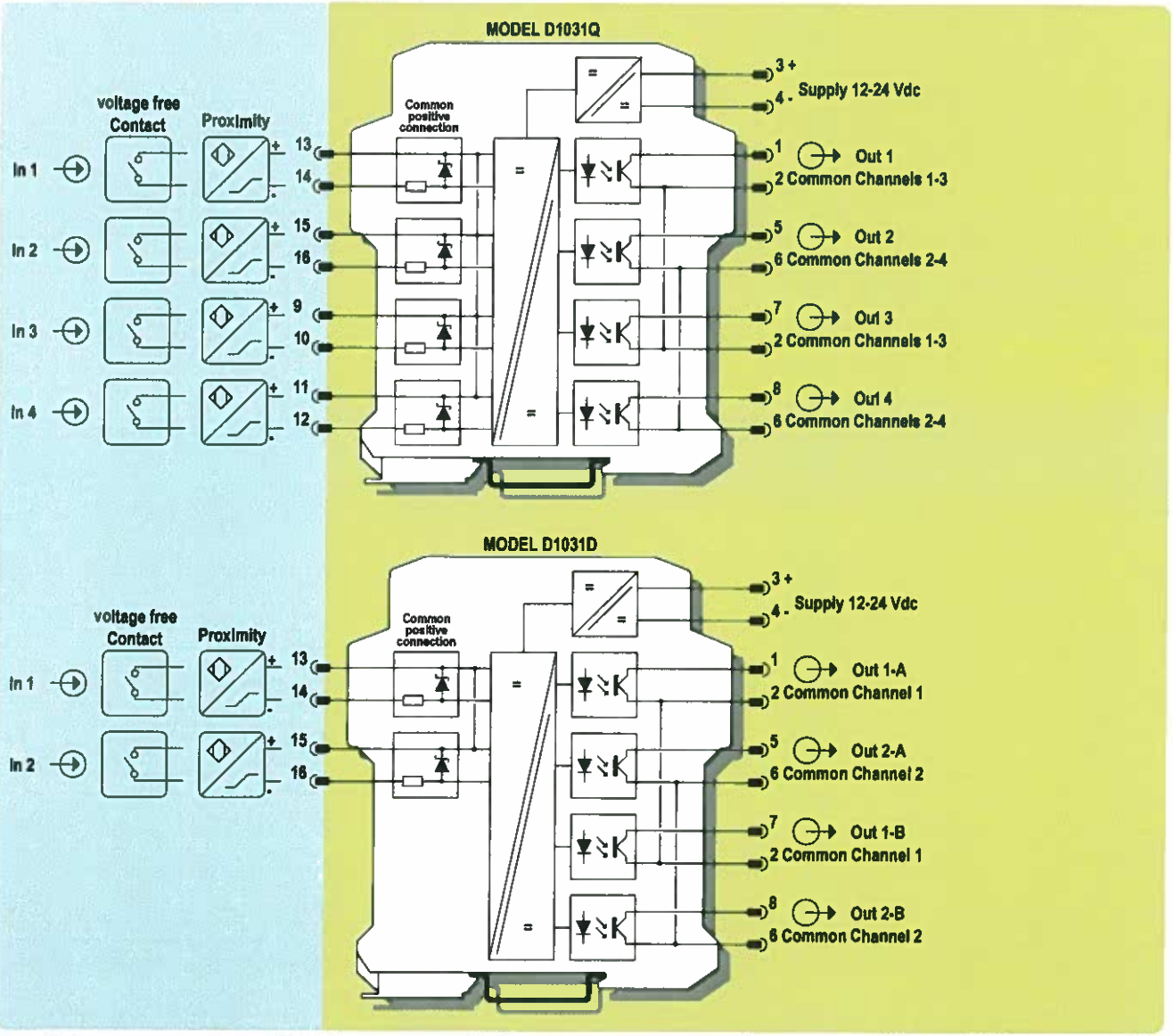
NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G
IIB equal to Gas Groups C, D, E, F and G
IIA equal to Gas Groups D, E, F and G

Image:

Function Diagram:

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



The C-more Family

Features	Base Model	Full Featured Model
More durable		
- 50,000 hour bulb life	y	y
- Replaceable bulbs on 8", 10", 12", and 15" models	-	y
Better screens		
- Bright screens (NIT ratings)	y	y
- TFT with 65,536 colors available on all sizes	y	y
- 15 shade monochrome STN screens on 6" models	y	y
More flexibility		
- Analog touch screen (no touch cell grid!)	y	y
- Overlapping objects	y	y
Better communications		
- USB Port-A	y	y
- USB Port-B	y	y
- Built-in Ethernet port	-	y
- Built-in serial communications	y	y
More capacity		
- Built-in 10Mbyte project memory	y	y
- CompactFlash card slot #1 (data logging)	-	y
- Supports USB memory devices (data logging)	y	y
- Symbol Factory™ library with 4,000 symbols.	y	y
More objects		
- Over 50 objects including 16 pen trends, switches, PID trend faceplate, PID bar graph faceplate	y	y
- Create custom objects and store in user library	y	y
- Improved multilanguage support for objects in German, French, Italian, Spanish, Chinese and Japanese characters	y	y
More high end features		
- Project simulator	y	y
- Bitmap animation	y	y
- E-mail messaging	-	y
- Built-in FTP server	-	y
- Pop-up window within a touch screen	y	y
- Data logging to USB/CompactFlash	USB only	y
- Historical alarms with time and date stamp along with alarm frequency reporting.	y	y
- Supports simultaneous communication to multiple brands of PLC/PACs.	-	y
- Event Manager	y	y
- Audio line out	-	y
Improved ease of use		
- Improved multi-language support.	y	y
- Improved dialog boxes	y	y
- "Power User" property box	y	y
- More fonts and sizes	y	y
- Master background screens	y	y
- Improved recipes	y	y
Optional accessories		
- Optional "Screw on" 110VAC power supply	y	y
- Expansion unit for additional CompactFlash	-	y

Supported drivers

All AutomationDirect.com PLCs and PC based control
K-Sequence (DL05/06/105/205/350/405)
DirectNET (DL05/06/105/205/350/405)
DirectNET (DL330/340)
Modbus (DL05/06/205/350/405)
Modbus (CLICK)
ECOM Ethernet (DL05/06/205/405) Ethernet
Productivity3000 PAC
Think & Do Modbus RTU (H2-WinPLC)
Think & Do Modbus TCP/IP Ethernet (H2-WinPLC)

Modbus RTU
Modbus TCP/IP Ethernet

Allen-Bradley:
AB DF1 Full Duplex (MicroLogix)
AB DF1 Full Duplex (SLC500)
AB DF1 Full Duplex (PLC5)
AB DF1 Full Duplex Tag-Based (ControlLogix/CompactLogix/FlexLogix)
AB DF1 Half Duplex (MicroLogix/SLC500)
AB DF1 Half Duplex Tag-Based (ControlLogix/CompactLogix/FlexLogix)
AB DH485 (MicroLogix/SLC500/AIC)
AB EtherNet/IP Client (MicroLogix 1100)
AB EtherNet/IP Client (SLC5/05/ENI Adapter)
AB EtherNet/IP Client Tag-Based (ControlLogix/CompactLogix/FlexLogix)
AB EtherNet/IP Server Generic IO Messaging (ControlLogix/CompactLogix/FlexLogix)

GE 90/30 and 90/70 SNPX
SNPX (90/30, 90/70, Micro90, VersaMox Micro)

Omron:
Host Link Adapter (C200/C500)
FINS Serial (CS/CJ)
FINS Ethernet (CS/CJ)

Mitsubishi:
FX Series CPU
FX-1N(C), 2N(C), 3U(C) CPU
Q Series (Q02, Q02H, Q06H, Q12H, Q25H CPU)
Q/QnA Serial
Q/QnA Ethernet

Siemens:
S7-200(Serial: PPI)
S7-200(Ethernet: ISO over TCP/IP)
S7-300(Ethernet: ISO over TCP/IP)

Allen-Bradley Tag Import

Import tags directly from the RSLogix 5000 L5K file. ***C-more*** Software now supports direct insertion of ControlLogix, CompactLogix and FlexLogix tags from the PLC into ***C-more*** (no mapping or translations required).

Maximum Connectivity

Communicate any way you want

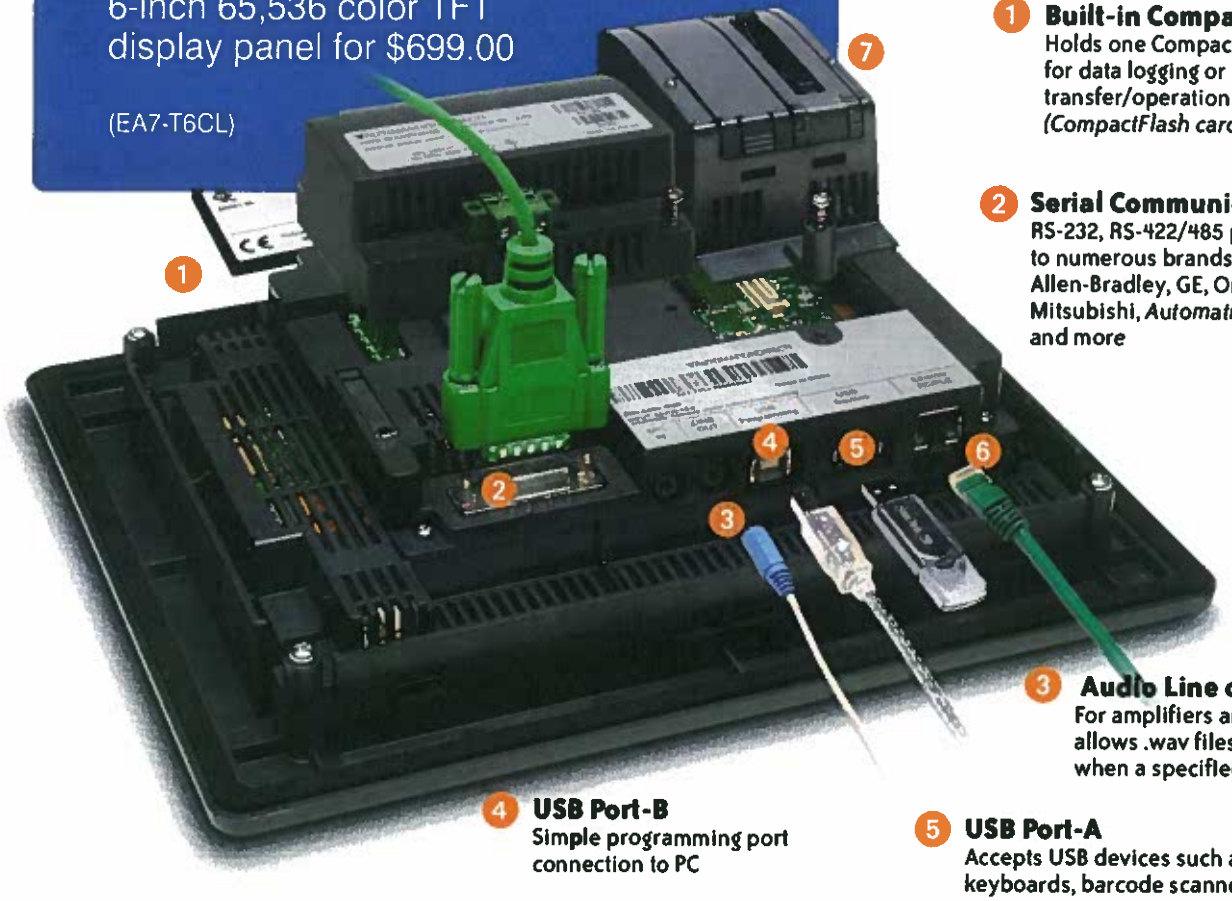
C-more **was designed to offer the widest range of connectivity options of any PLC touch panel in its class. Starting at $699.00 (EA7-T6CL), you can have a 6-inch panel with a 65,536 color TFT display with all these features:**

- Built-in 10/100 Base-T Ethernet *(upload/download programs over the network)*
- FTP data exchange
- Send e-mails to PCs, cell phones, etc.
- Connect to A-B EtherNet/IP™, Modbus/TCP, ***Direct***LOGIC ECOM
- Built-in USB port A *(connect to memory sticks for data logging, bar code readers, scanners, tD readers, keyboards)*
- Built-in USB Port-B (for programming)
- Built-in Audio Line out *(plays .wav files)*
- Built-in serial communication port that connects to PLC/PACs from various manufacturers *(use this port and the Ethernet port to connect simultaneously to multiple brands of PLC/PAC)*
- Built-in CompactFlash port for data logging

Want to pay less? Get all this connectivity on a 6-inch grayscale display for $499.00 (EA7-S6M).

Get all this connectivity on a 6-inch 65,536 color TFT display panel for $699.00

(EA7-T6CL)



1 Built-in CompactFlash port*
Holds one CompactFlash card; used for data logging or user program transfer/operation *(CompactFlash card sold separately)*

2 Serial Communication port
RS-232, RS-422/485 port, connects to numerous brands including Allen-Bradley, GE, Omron, Mitsubishi, *AutomationDirect* and more

3 Audio Line out*
For amplifiers and speakers; allows .wav files to be played when a specified event occurs

4 USB Port-B
Simple programming port connection to PC

5 USB Port-A
Accepts USB devices such as memory sticks, keyboards, barcode scanners, etc.

6 10/100 Base-T Ethernet*
Upload/download programs over network, connect to many brands of PLC/PACs *(A-B EtherNet/IP™, Modbus TCP/IP, **Direct**LOGIC ECOM, Productivity3000)*, connect to standard Ethernet hubs, etc.

7 Expansion Assembly**
EA-EXP-OPT ($9.00), holds one CompactFlash card *(installed in CF card interface module EA-CF-IF ($48.00))* and one future module

* Available only on full featured units ** Available only on full featured units and sold separately

Smart Power Supply Options and a 2 Year Warranty!

Add the 110 VAC power supply for improved reliability

C-more comes with a built-in 24 VDC power supply with a removable connector for easy installation. This is great for applications that have good clean 24 VDC power. However, there are many situations where the DC power in a cabinet does not meet required specifications for instrumentation.

C-more offers an optional 100-240 VAC screw-on power adapter (EA-AC) that improves panel reliability. Since it is built specifically for **C-more**, it offers power fault detection with sequential shut-down, and will set an error flag that can be configured with a time and date stamp to help troubleshoot a problem.

The power fault detection will attempt to "close" data logging files on compact flash drives to prevent file corruption. If data logging is critical to your applications, the EA-AC power adapter is a must.

Power Fault Detection

Sequential Shut-down

Error Flag you can log

1 Optional 110 VAC to 24 VDC Power Supply
- Improves panel reliability
- Power fault protection with sequential shut-down
- Sets error flag; can configure tag with time and date stamp

2 Standard Power Connection
24 VDC 1.5 Amp supply required

3 Removable Power Terminal Block
for quick disconnect

2-year warranty because it's been designed with quality in mind

C-more is built by our parent company, Koyo Electronics. For over 50 years, Koyo has been a world class manufacturer of reliable and best value products. They are part of the multi-billion dollar JTEKT Group designing and manufacturing OEM products for demanding customers such as Toyota Motors. Koyo designed **C-more** to meet the most stringent quality requirements, and is confident to offer a 2-year limited warranty on all **C-more** panels.

C-more Selection Guide & Specifications

Specification \ Model	6" STN grayscale w/ base features	6" TFT color w/ base features	6" STN grayscale w/ full features	6" TFT color w/ full features
Part Number	**EA7-S6M-R**	**EA7-T6CL-R**	**EA7-S6M**	**EA7-T6CL**
				
Price	<--->	<--->	<--->	<--->
Display Actual Size and Type	5.7" STN grayscale	5.7" TFT color	5.7" STN grayscale	5.7" TFT color
Color Scale	15 shades of gray	65,536 colors	15 shades of gray	65,536 colors
Display Viewing Area	4.54" x 3.4" [115.2 mm x 86.4 mm]			
Screen Pixels	320 x 240 (QVGA)			
Display Brightness	150 cd/m² (NITS)	270 cd/m² (NITS)	150 cd/m² (NITS)	270 cd/m² (NITS)
LCD Panel Dot Pitch	0.36 mm x 0.36 mm			
Backlight Average Lifetime*	Approximately 50,000 hours			
Backlight User Replaceable	No			
Touch Panel Type	Analog Resistive (10-bit resolution, 1024 x 1024 touch area)			
CPU Type	32-Bit RISC CPU (333 MHz)			
Battery	Replaceable battery – ADC Part # D2-BAT-1 (Manufacturer Part # CR2354)			
System Memory	SDRAM 32 MBytes			
System Flash Memory	FLASH 32 MBytes			
Backup Memory (SRAM)	Control data backup memory (SRAM) 256 KBytes			
Logging Data Memory	USB Pen Drive p/n SDCZ4-2048-A10 (Optional)		CompactFlash Memory Card p/n EA-CF-CARD, industrial grade, high speed (Optional) or USB Pen Drive p/n SDCZ4-2048-A10 (Optional)	
Number of Screens	Up to 9999 with ver. 2.40 and later – limited by project memory (10 MBytes)			
Realtime Clock	Built into panel (PLC clock is still accessible if available)			
Calendar – Month/Day/Year	Yes - battery backup			
Screen Saver	Yes, backlight turns off after a 30–1500 minute adjustable time, or can be disabled			
Serial PLC Interface	Serial PLC Port: RS-232/422/485 15-Pin D-sub (female)			
USB Port – Type B	Download/Program – USB Port – type B (ver. 1.2)			
USB Port – Type A	Port for USB device options – type A (ver. 1.2)			
Ethernet Port	not available		Ethernet 10/100 Base-T	
Audio Line Out	not available		Audio Line Out, 1 Volt rms, stereo – requires amplifier and speaker(s)	
CF Card – Slot #1	not available		Optional: CompactFlash Memory Card p/n EA-CF-CARD, industrial grade, high speed, CF slot #1 located on top side of touch panel.	
Expansion Assembly (p/n EA-EXP-OPT)	not available		Optional: Use the CF Card Interface Module p/n EA-CF-IF in the right slot of the Expansion Assembly for installing CF card - Slot #2. The left slot of the Expansion Assembly is for future options.	
Supply Power	24 VDC, -15%, +20% (20.4–28.8 VDC oper. range) (Use AC Power Adapter, p/n EA-AC, to power panel from a 100-240 VAC, 50/60 Hz. power source.)			
Power Consumption	9W @ 24 VDC	9 W @ 24 VDC	10 W @ 24 VDC	11 W @ 24 VDC
Recommended Input Fuse	3.0 A DC slow blow			
Operating Temperature	0 to 50 °C (32 to 122 °F); Maximum surrounding air temperature rating: 50 °C (122 °F)			
Storage Temperature	–20 to +60°C (–4 to +140°F)			
Humidity	10–85% RH, non-condensing			
Noise Immunity	Noise voltage: 1,000 Vp-p, Pulse width: 1 µs, Rise time: 1 ns			
Withstand Voltage	1,000 VDC for 1 minute, between DC power supply input terminal and safety ground			
Insulation Resistance	Over 20 MΩ between DC power supply input terminal and safety ground			
Vibration	IEC61131-2 compliant, 10–57 Hz: 0.075 mm amplitude, 57–150 Hz 1.0 G: 10 sweep cycles per axis on each of 3 mutually perpendicular axes			
Shock	15 G peak, 11 ms duration, 2 shocks per axis, on 3 mutually perpendicular axes			
Enclosure	IP65 Meets UL Type 4X when mounted correctly. For indoor use only.			
Environment	For use in Pollution Degree 2 Environment			
Agency Approvals	UL, cUL, CE; UL file 157382			
Dimensions	6.140" x 8.047" x 1.697" [156.0 mm x 204.4 mm x 43.1 mm]			
Weight	1.46 lb. [660 g]	1.43 lb. [650 g]	1.50 lb. [680 g]	1.48 lb. [670 g]

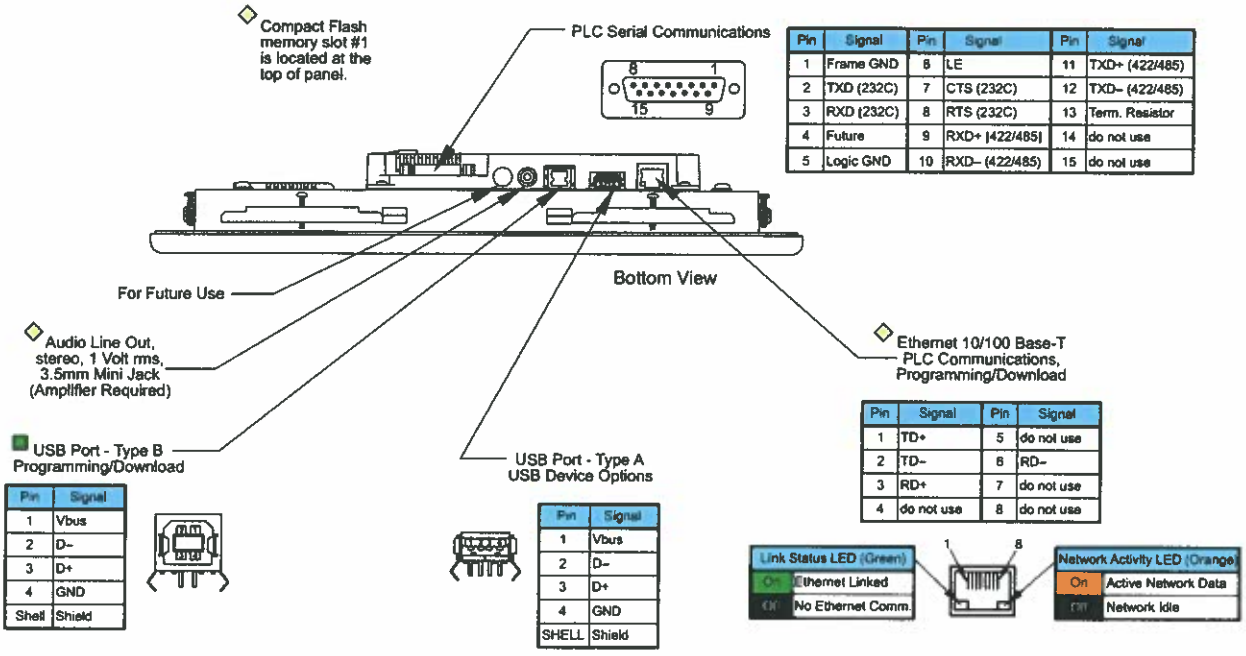
NOTE: The backlight average lifetime is defined as the average usage time it takes before the brightness becomes 50% of the initial brightness. The lifetime of the backlight depends on the ambient temperature. The lifetime will decrease under low or high temperature usage.

C-more Selection Guide & Specifications

Specification \ Model	8" TFT color w/ full features	10" TFT color w/ full features	12" TFT color w/ full features	15" TFT color w/ full features
Part Number	**EA7-T8C**	**EA7-T10C**	**EA7-T12C**	**EA7-T15C**
				
Price	<--->	<--->	<--->	<--->
Display Actual Size and Type	8.4" TFT color	10.4" TFT color	12.1" TFT color	15.0" TFT color
Color Scale	65,536 colors			
Display Viewing Area	6.73" x 5.05" [170.9 mm x 128.2 mm]	8.31" x 6.24" [211.2 mm x 158.4 mm]	9.47" x 7.62" (240.6 mm x 184.5 mm]	11.97" x 8.98" [304.1 mm x 228.1 mm]
Screen Pixels	640 x 480 (VGA)		800 x 600 (SVGA)	1024 x 768 (XGA)
Display Brightness	300 cd/m² (NITS)	270 cd/m² (NITS)	260 cd/m² (NITS)	220 cd/m² (NITS)
LCD Panel Dot Pitch	0.267 mm x 0.267 mm	0.33 mm x 0.33 mm	0.267 mm x 0.267 mm	0.297 mm x 0.297 mm
Backlight Average Lifetime*	Approximately 50,000 hours			
Backlight User Replaceable	Yes - Part Number EA-xx-BULB, xx = panel size			
Touch Panel Type	Analog Resistive (10-bit resolution, 1024 x 1024 touch area)		Analog Resistive (12-bit resolution, 4096 x 4096 touch area)	
CPU Type	32-Bit RISC CPU (400 MHz)		32-Bit RISC CPU (400 MHz) Plus Graphic Accelerator Chip	
Battery	Replaceable battery – ADC Part # D2-BAT-1 (Manufacturer Part # CR2354)			
System Memory	SDRAM 32 MBytes		SDRAM 64 MBytes	
System Flash Memory	FLASH 32 MBytes		FLASH 64 MBytes	
Backup Memory (SRAM)	Control data backup memory (SRAM) 256 KBytes			
Logging Data Memory	CompactFlash Memory Card p/n EA-CF-CARD, industrial grade, high speed (Optional) or USB Pen Drive p/n SDCZ4-2048-A10 (Optional)			
Number of Screens	Up to 999 – limited by available project memory (10 MBytes)		Up to 999 – limited by available project memory (40 MBytes)	
Realtime Clock	Built into panel (PLC clock is still accessible if available)			
Calendar – Month/Day/Year	Yes - battery backup			
Screen Saver	Yes, backlight turns off after a 30–1500 minute adjustable time, or can be disabled			
Serial PLC Interface	Serial PLC Port: RS-232C/422/485 15-Pin D-sub (female)			
USB Port – Type B	Download/Program – USB Port – type B (ver. 1.2)			
USB Port – Type A	Port for USB device options – type A (ver. 1.2)			
Ethernet Port	Ethernet 10/100 Base-T			
Audio Line Out	Audio Line Out, 1 Volt rms, stereo – requires amplifier and speaker(s)			
CF Card – Slot #1	Optional: CompactFlash Memory Card p/n EA-CF-CARD, industrial grade, high speed, CF slot #1 located on top side of touch panel.			
Expansion Assembly (p/n EA-EXP-OPT)	Optional: Use the CF Card Interface Module p/n EA-CF-IF in the right slot of the Expansion Assembly for installing CF card - Slot #2. The left slot of the Expansion Assembly is for future options.			
Supply Power	24 VDC, -15%, +20% (20.4–28.8 VDC operating range) (Use an AC Power Adapter, p/n EA-AC, to power the touch panel from a 100-240 VAC, 50/60 Hz. power source.)			
Power Consumption	15 W @ 24 VDC	17 W @ 24 VDC	20 W @ 24 VDC	33 W @ 24 VDC
Recommended Input Fuse	3.0 A DC slow blow			
Operating Temperature	0 to 50°C (32 to 122°F) Max surrounding air temperature rating: 50°C			
Storage Temperature	–20 to +60°C (–4 to +140°F)			
Humidity	10–85% RH, non-condensing			
Noise Immunity	Noise voltage: 1000 Vp-p, Pulse width: 1 µs, Rise time: 1 ns			
Withstand Voltage	1000 VDC for 1 minute, between DC power supply input terminal and safety ground			
Insulation Resistance	Over 20 MΩ between DC power supply input terminal and safety ground			
Vibration	IEC61131-2 compliant, 10–57 Hz: 0.075 mm amplitude, 57–150 Hz 1.0 G: 10 sweep cycles per axis on each of 3 mutually perpendicular axes			
Shock	15 G peak, 11 ms duration, 2 shocks per axis, on 3 mutually perpendicular axes			
Enclosure	IP65 Meets UL Type 4X when mounted correctly. For indoor use only.			
Environment	For use in Pollution Degree 2 Environment			
Agency Approvals	UL, cUL, CE; UL file 157382			
Dimensions	8.748" x 10.894" x 2.053" [222.2 mm x 276.7 mm x 52.1 mm]	10.669" x 13.661" x 2.079" (271.0 mm x 347.0 mm x 52.8 mm]	11.024" x 13.366" x 2.075" [280.0 mm x 339.5 mm x 52.7 mm]	13.000" x 16.748" x 2.048" (330.2 mm x 425.4 mm x 52.0 mm]
Weight	2.60 lb. [1,180 g]	3.55 lb. (1,610 g]	4.59 lb. [2,080 g]	7.01 lb. (3,180 g]

**** NOTE: The backlight average lifetime is defined as the average usage time it takes before the brightness becomes 50% of the initial brightness. The lifetime of the backlight depends on the ambient temperature. The lifetime will decrease under low or high temperature usage.***

C-more Communication Ports



Pin	Signal	Pin	Signal	Pin	Signal
1	Frame GND	6	LE	11	TXD+ (422/485)
2	TXD (232C)	7	CTS (232C)	12	TXD– (422/485)
3	RXD (232C)	8	RTS (232C)	13	Term. Resistor
4	Future	9	RXD+ (422/485)	14	do not use
5	Logic GND	10	RXD– (422/485)	15	do not use

Pin	Signal
1	Vbus
2	D–
3	D+
4	GND
Shell	Shield

Pin	Signal
1	Vbus
2	D–
3	D+
4	GND
SHELL	Shield

Pin	Signal	Pin	Signal
1	TD+	5	do not use
2	TD–	6	RD–
3	RD+	7	do not use
4	do not use	8	do not use

◇ Note: Device is not available on Base Feature touch panels, part numbers EA7-S6M-R and EA7-T6CL-R.

■ Note: Use USB Programming Cable, such as p/n USB-CBL-AB15.

Ethernet Port

The Ethernet port has several uses:

- Download program to panel
- Communicate to PLCs/PCs
- Send e-mail
- Access FTP server
- Act as a Web server
- Remote Internet Access

The Ethernet port has an RJ-45 8-wire modular connector with green and orange LEDs.

- The orange LED indicates the Ethernet communication status. It illuminates when there is data activity on the network.
- The green LED indicates link status and illuminates when a link is established.

Ethernet connections:

- Productivity3000
- ***Direct***LOGIC Ethernet
- Modbus TCP/IP
- Allen-Bradley EtherNet/IP™ Server - Generic I/O Messaging (ControlLogix™, CompactLogix™, and FlexLogix™)
- Allen-Bradley EhterNet/IP Client - Tag Based (ControlLogix, CompactLogix, and FlexLogix™)
- Allen-Bradley EtherNet/IP Client - MicroLogix 1100 & SLC 5/05, both via native Ethernet port
- Allen-Bradley MicroLogix 1000, 1100, 1200, 1500, SLC 5-03/04/05, all via ENI Adapter
- Entivity Modbus TCP/IP
- Omron Ethernet FINS
- Siemens Ethernet ISO over TCP

Note: The base panels (-R part numbers) do not include an Ethernet port, and do not have these capabilities.

USB Port B

Program **C-more** via the USB programming port. It's fast and easy, with no baud rate settings, parity, or stop bits to worry about. We stock standard USB cables for your convenience. USB Part B can be used to upload or download projects to and from a PC.

USB Port A

The Universal Serial Bus (USB) Port A is a standard feature for all models and can be used to connect various USB HID (Human Input Device) devices to the panel, such as:

- USB pen drives, (SDCZ4-2048-A10)
- USB keyboards
- USB barcode scanners
- USB card scanners

C-more can log data to the USB pen drive as well as load projects to the panel from the pen drive. You can also back up project files and panel firmware.

Sound Interface (Audio Line Out)

When attached to an amplifier and speaker(s), **C-more** can play warning sounds or pre-recorded messages such as: "conveyor is jammed". **C-more** supports WAV type files. The output is stereo.

Serial Port

The serial port is an RS-232, RS-422 or RS-485 female 15-pin D-sub connector. Use this port for serial connections to PLCs. The port supports the following PLC protocols:

All AutomationDirect.com PLCs:
- Productivity3000
- ***Direct***LOGIC K-sequence
- ***Direct***NET
- Modbus (Koyo Addressing)
- CLICK

Allen Bradley:
- DF1 Full & Half Duplex
- DF1 Full & Half Duplex - Tag Based
- PLC5 DF1
- DH485

Modbus RTU
Entivity Modbus RTU
GE SNPX (90/30, 90/70, Micro 90, VersaMax Micro)
Omron:
- Host Link (C200 Adapter, CS00)
- FINS (CJ1, CS1)

Mitsubishi:
- Melsec FX
- Q/QnA

Siemens PPI (S7-200 CPU)

C-more Communication Protocols & Cables

Compatibility Table			
PLC Family	**Model**		**Protocols**
Allen-Bradley	MicroLogix 1000/1100/1200/1400/1500, SLC 5-/01/02/03, PLC5		DH485/AIC/AIC+
	MicroLogix 1000, 1100, 1200 and 1500		DF1 Half Duplex; DF1 Full Duplex
	SLC 5-/03/04/05		
	ControlLogix™, CompactLogix™, FlexLogix™		
	PLC-5		DF1 Full Duplex
	ControlLogix, CompactLogix, FlexLogix - Tag Based		DF1 Half Duplex; DF1 Full Duplex
	ControlLogix, CompactLogix, FlexLogix - Generic I/O Messaging		EtherNet/IP Server
	ControlLogix, CompactLogix, FlexLogix - Tag Based		EtherNet/IP Client
	MicroLogix 1100 & SLC 5/05, both via native Ethernet port		
	MicroLogix 1000, 1100, 1200, 1400,1500 & SLC 5-03/04/05, all via ENI Adapter		
Modbus TCP/IP	Modbus TCP/IP devices		Modbus TCP/IP
GE	90/30, 90/70, Micro 90, VersaMax Micro		SNPX
Mitsubishi	FX Series		FX Direct
	Q02, Q02H, Q06H, Q12H, Q25H		Q CPU
	Q, QnA Serial		QnA Serial
	Q, Qna Ethernet		QnA Ethernet
Omron	C200 Adapter, C500		Host Link
	CJ1/CS1 Serial, CJ1/CS1 Ethernet		FINS
Modicon	984 CPU, Quantum 113 CPU, AEG Modicon Micro Series 110 CPU: 311-xx, 411-xx, 512-xx, 612-xx		Modbus RTU
Siemens	S7-200 CPU, RS-485 Serial		PPI
	S7-200 CPU, S7-300 CPU; Ethernet		Ethernet ISO over TCP
Productivity3000	Productivity3000 Serial (P3-550)		AutomationDirect P3000 Serial
	Productivity3000 Ethernet (P3-550)		AutomationDirect P3000 Ethernet
CLICK	all		AutomationDirect Modbus (CLICK)
DirectLOGIC	DL05/DL06	all	K-Sequence
			DirectNET
			Modbus (Koyo addressing)
		H0-ECOM/H0-ECOM100	DirectLOGIC Ethernet
	DL105	all	K-Sequence
	DL205	D2-230	K-Sequence
		D2-240	K-Sequence
			DirectNET
		D2-250/D2-250-1/D2-260	K-Sequence
			DirectNET
			Modbus (Koyo addressing)
		D2-240/D2-250-1/D2-260 Using DCM	DirectNET
			Modbus (Koyo addressing)
		H2-ECOM/H2-ECOM100	DirectLOGIC Ethernet
	DL305	D3-330/330P (Requires the use of a Data Communications Unit)	DirectNET
		D3-340	DirectNET
		D3-350	K-Sequence
			DirectNET
			Modbus (Koyo addressing)
		D3-350 DCM	DirectNET
			Modbus (Koyo addressing)
	DL405	D4-430	K-Sequence
			DirectNET
		D4-440	K-Sequence
			DirectNET
		D4-450	K-Sequence
			DirectNET
			Modbus (Koyo addressing)
		All with DCM	DirectNET
			Modbus (Koyo addressing)
		H4-ECOM/H4-ECOM100	DirectLOGIC Ethernet
	H2-WinPLC (Think & Do) Live V5.2 or later and Studio any version		Think & Do Modbus RTU (serial port)
	H2-WinPLC (Think & Do) Live V5.5.1 or later and Studio V7.2.1 or later		Think & Do Modbus TCP/IP (Ethernet port)

Cable Description	Cable Part Number	Price
AutomationDirect CLICK, DirectLOGIC PLC RJ-12 port, DL05, DL06, DL105, DL205, D3-350, D4-450 & H2-WinPLC (RS-232C)	EA-2CBL	<--->
DirectLOGIC (VGA Style) 15-pin port, DL06, D2-250 (250-1), D2-260 (RS-232C)	EA-2CBL-1	<--->
DirectLOGIC PLC RJ-11 port, D3-340 (RS-232C)	EA-3CBL	<--->
DirectLOGIC DL405 PLC 15-pin D-sub port, DL405 (RS-232C)	EA-4CBL-1	<--->
DirectLOGIC PLC 25-pin D-sub port, DL405, D3-350, DL305 DCU and all DCM's (RS-232C)	EA-4CBL-2	<--->
Allen-Bradley MicroLogix 1000, 1100, 1200, 1400 & 1500 (RS-232C)	EA-MLOGIX-CBL	<--->
Allen-Bradley SLC 5-03/04/05 ControlLogix, CompactLogix, FlexLogix, DF1 port (RS-232C)	EA-SLC-232-CBL	<--->
Allen-Bradley PLC-5 DF1 port (RS-232C)	EA-PLC5-232-CBL	<--->
Allen-Bradley SLC 500 DH485 port (RS-485A)	EA-DH485-CBL	<--->
GE 90/30, 90/70, Micro 90, VersaMax Micro 15-pin D-sub port (RS-422A)	EA-90-30-CBL	<--->
MITSUBISHI FX Series 25-pin port (RS-422A)	EA-MITSU-CBL	<--->
MITSUBISHI FX Series 8-pin mini-DIN (RS-422A)	EA-MITSU-CBL-1	<--->
OMRON Host Link C200 Adapter, C500 (RS-232C)	EA-OMRON-CBL	<--->

NOTE: EZTouch serial PLC communication cables are compatible with C-more touch panels.

EA-2CBL

EA-2CBL-1

C-more 3" Micro-Graphic STN Touch Panel

Model EA1-S3ML **C-more** 3" Micro-Graphic touch panel has a 3.1-inch STN LCD monochrome display and five selectable LED-driven backlight colors: Green, Red, Amber, Yellow and Lime. It features a 128 x 64 dot display, and five user-defined function keys each with a user-defined red LED indicator. The panel can display up to 10 lines by 32 characters of static text and up to 10 lines by 21 characters of dynamic text with embedded variables and phrases mixed with graphics. It is rated UL for use on a flat surface of Type 1, 4X enclosure (for indoor use only). This Micro-Graphic panel can receive power from the serial communications port of most AutomationDirect PLCs. An EA-MG-SP1 Serial Port with DC Power Adapter option module (RS-232/422/485) is required when using other controllers.

Part No. EA1-S3ML

<--->

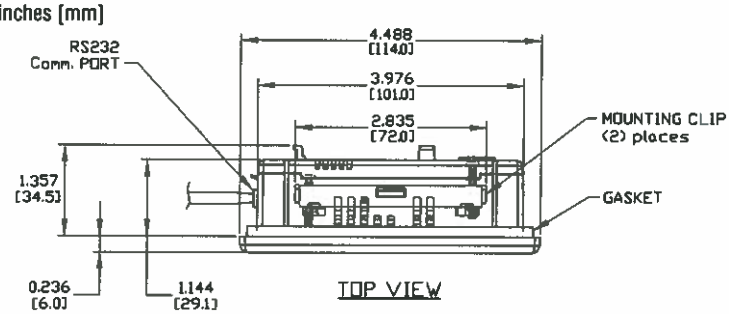
Features

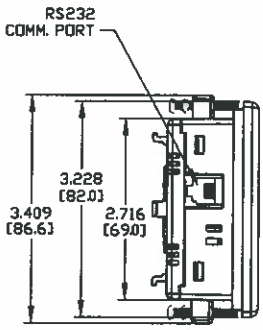
- Touch screen display
- Free downloadable programming software
- 128 x 64 Dot display with up to 10 lines by 32 characters of text and graphics
- Up to 10 lines by 21 characters of dynamic text with embedded variables and phrases mixed with graphics
- 5 programmable function keys can change with every screen. Can increment / decrement values, trigger recipes, view index of screens.
- 5-Color LED backlight for longer lifetime; Green, Red, Amber, Yellow and Lime
- 2 optional snap-on keypad bezels
- 768 KB memory
- Panel is powered from PLC comm port when using select AutomationDirect PLCs. Use optional DC power adapter and serial port modules if needed for other controllers (RS-232/422/485)
- Built in Alarm Control setup that activates beep, backlight flash, customized alarm banner, and LED blinking
- 0 to 50 °C (32 to 122 °F) operating temperature range (IEC 60068-2-14)
- NEMA 4/4X, IP65 compliant when mounted correctly, indoor use only
- UL, cUL & CE agency approvals
- 2-year warranty from date of purchase

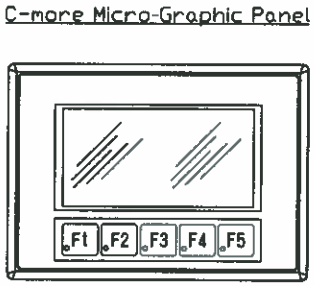
NOTE: Don't forget the optional keypad bezels, DC power adapter and serial port with DC power adapter shown in the Accessories.

Dimensions

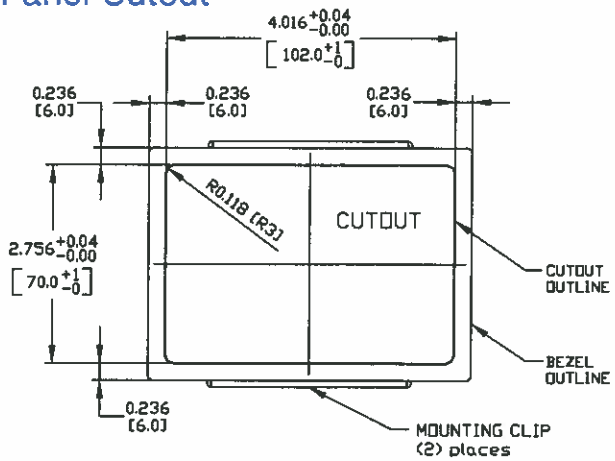
Units: inches [mm]



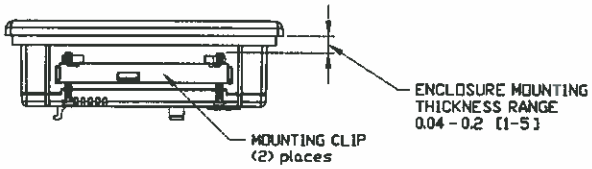




Panel Cutout



Panel Thickness



NOTE: The *C-more* 3" Micro-Graphic cutout dimensions are not equivalent to previous *AutomationDirect* text panels. The *C-more* Micro-Graphic panels will not fit in cutouts for DV-1000, EZText or Optimate panels.

C-more 3" Micro-Graphic STN Touch Panel

Model EA1-S3MLW **C-more** 3" Micro-Graphic touch panel has a 3.1-inch STN LCD monochrome display and five selectable LED-driven backlight colors: White, Pink1, Pink2, Pink3 and Red. It features a 128 x 64 dot display, and five user-defined function keys each with a user-defined red LED indicator. The panel can display up to 10 lines by 32 characters of static text and up to 10 lines by 21 characters of dynamic text with embedded variables and phrases mixed with graphics. It is rated UL for use on a flat surface of Type 1, 4X enclosure (for indoor use only). This Micro-Graphic panel can receive power from the serial communications port of most AutomationDirect PLCs. An EA-MG-SP1 Serial Port with DC Power Adapter option module (RS-232/422/485) is required when using other controllers.

Part No. EA1-S3MLW

<--->

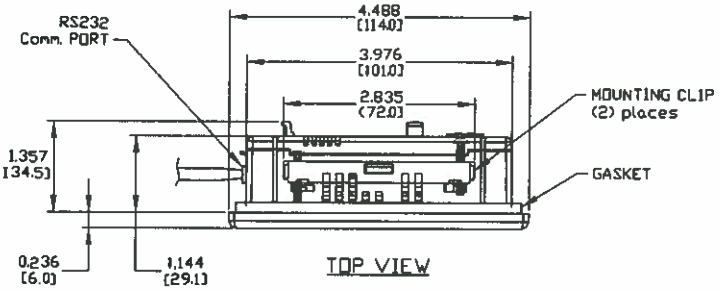
Features

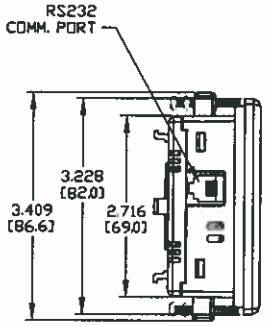
- Touch screen display
- Free downloadable programming software
- 128 x 64 Dot display with up to 10 lines by 32 characters of text and graphics
- Up to 10 lines by 21 characters of dynamic text with embedded variables and phrases mixed with graphics
- 5 programmable function keys can change with every screen. Can increment / decrement values, trigger recipes, view index of screens.
- 5-Color LED backlight for longer lifetime; White, Pink1, Pink2, Pink3 and Red
- 2 optional snap-on keypad bezels
- 768 KB memory
- Panel is powered from PLC comm port when using select AutomationDirect PLCs. Use optional DC power adapter and serial port modules if needed for other controllers (RS-232/422/485)
- Built-in Alarm Control setup that activates beep, backlight flash, customized alarm banner, and LED blinking
- 0 to 50 °C (32 to 122 °F) operating temperature range (IEC 60068-2-14)
- NEMA 4/4X, IP65 compliant when mounted correctly, indoor use only
- UL, cUL & CE agency approvals
- 2-year warranty from date of purchase

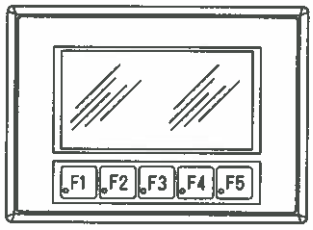
NOTE: Don't forget the optional keypad bezels, DC power adapter and serial port with DC power adapter shown in the Accessories.

Dimensions

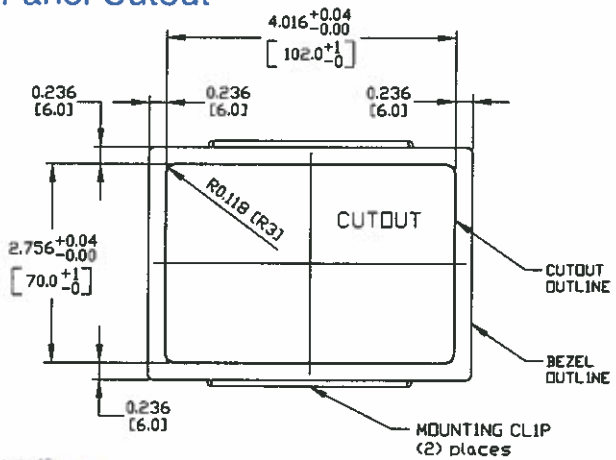
Units: Inches [mm]



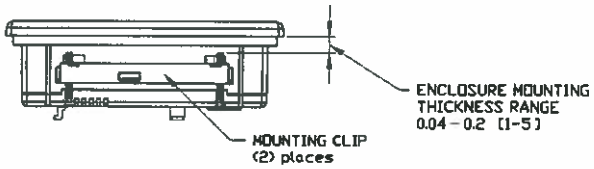




Panel Cutout



Panel Thickness



NOTE: The *C-more* 3" Micro-Graphic cutout dimensions are not equivalent to previous *AutomationDirect* text panels. The *C-more* Micro-Graphic panels will not fit in cutouts for DV-1000, EZText or Optimate panels.

C-more 3" Micro-Graphic Specifications

Specification \ Model	3" STN Micro-Graphic Panel Touch Screen	3" STN Micro-Graphic Panel Non-Touch Screen
Part Number	EA1-S3ML, EA1-S3MLW	EA1-S3ML-N, EA1-S3MLW-N
Description	128 x 64 dots LCD display, five user defined keypad function buttons, and five user defined LED's	
Display		
• Type	3.1" STN monochrome LCD, graphical characters	
• Resolution	128 (W) x 64 (H) dots	
• Color	2 colors (normal / inverse)	
• Viewing Area Size	2.789" (W) x 1.385" (H) [70.8 mm x 35.2 mm]	
• Active Area Size	2.670" (W) x 1.259" (H) [67.8 mm x 32.0 mm]	
• Contrast	Adjusted from the panel's built-in configuration setup menu	
• Viewing Angle	3, 9 o'clock axis –> 45 degrees 6 o'clock axis –> 45 degrees 12 o'clock axis –> 30 degrees	
Backlight		
• Type	LED	
• Color	5 user defined colors: **EA1-S3ML, EA1-S3ML-N** - Red, Green, Amber, Lime, and Yellow **EA1-S3MLW, EA1-S3MLW-N** - White, Pink1, Pink2, Pink3 and Red	
• User Replaceable	No	
Touch Screen		
• Type	Analog touch panel	N/A
• Operation	51 gram force [0.5 N] maximum	N/A
• Life	Minimum of 1,000,000 cycles	N/A
Features		
• User Memory	768 KB	
• Number of Screens	Up to 999 – limited by project memory usage	
• Beep (Internal)	Yes	
• Keypad Function Buttons	Five user defined function key buttons with the ability to customize the label. Minimum of 500,000 cycles	
• Keypad Function Button LEDs	Each function key button includes a red LED that can be user programmed.	
• Serial Communications	Built-in RJ12 serial communications port (RS-232). Optional serial communications port (RS-232, RS-485/422) when using the optional EA-MG-SP1 Serial Port with DC Power Adapter.	
• Expansion Connection	Yes – used with optional Keypad Bezels, EA-MG-BZ1 & BZ2, and EA-MG-P1 DC Power Adapter, and EA-MG-SP1 Serial Port with DC Power Adapter.	
Screen Objects		
• Functional Devices	Push Button, Switch, Indicator Button, Indicator Light, Graphic Indicator Light, Numeric Display, Numeric Entry, Inc/Dec Value, Bar Graph, Bitmap Button, Static Bitmap, Dynamic Bitmap, Recipe Button, Static Text, Lookup Text, Dynamic Text, Scroll Text, Screen Change Push Button, Screen Selector, Adjust Contrast, Function, Key Configuration Object, Realtime Graph, Line Graph, Analog Meter	
• Static Shapes	Lines, Rectangles, Circles and Frames	
• Displayable Fonts	Fixed fonts: 4x6, 6x6, 6x6B, 6x8, 8x16, 8x32, 8x64, 16x16, 16x32, 16x64, 32x16, 32x32, 32x64, and Windows fonts	

C-more 3" Micro-Graphic panel specifications continued on next page.

NOTE: Photo includes EA-MG-BZ2

C-more 3" Micro-Graphic Specifications

Specification \ Model	3" STN Micro-Graphic Panel Touch Screen	3" STN Micro-Graphic Panel Non-Touch Screen
Part Number	EA1-S3ML, EA1-S3MLW	EA1-S3ML-N, EA1-S3MLW-N
Electrical		
• Input Voltage Range	5.0 VDC (4.75 – 5.25 VDC)	
• Input Power	Supplied through the panel's RJ12 serial communications port connection when used with any AutomationDirect PLC having an RJ12 communication port. Can also be supplied from an external 12-24 VDC power source when using the optional EA-MG-P1 DC Power Adapter, or the optional EA-MG-SP1 Serial Port with DC Power Adapter	
• Power Consumption	1.05W (220mA @ 4.75 VDC)	
• Recommended Fuse	Type AGC fast acting glass fuse, 250 mA, 250 VAC, ADC p/n AGC-25 No fuse required when directly connected to a PLC or PC with recommended cable.	
• Maximum Inrush Current	1 A for 500 µs	
• Acceptable External Power Drop Duration	Maximum 1 ms	
Environmental		
• Operating Temperature	0 to 50 °C (32 to 122 °F) Maximum surrounding air temperature rating: 50 °C	
• Storage Temperature	–20 to +60 °C (–4 to +140 °F)	
• Humidity	5–95% RH (non-condensing)	
• Environmental Air	For use in Pollution Degree 2 Environment	
• Vibration	IEC60068-2-6 (Test Fc), 5-9 Hz: 3.5 mm amplitude, 9-150 Hz: 1.0G, sweeping, at a rate of 1 octave/min. (±10%), 10 sweep cycles per axis on each of 3 mutually perpendicular axes	
• Shock	IEC60068-2-27 (Test Ea), 15 G peak, 11 ms duration, three shocks in each direction per axis, on 3 mutually perpendicular axes (total of 18 shocks)	
• Noise Immunity	NEMA ICS3-304 RFI, (145 MHz, 440 Mhz 10 W @ 10 cm) Impulse 1000 V @ 1 µs pulse	
• Enclosure	For use on a flat surface of Type 1, 4X enclosure (Indoor use only)	
• Agency Approvals	CE (EN61131-2), UL508, CUL Canadian C22.2 No. 142-M95, UL File E157382	
Physical		
• Dimensions	4.488" (W) x 3.228" (H) x 1.593" (D) [114.0 mm x 82.0 mm x 40.5 mm]	
• Enclosure Mounting Thickness Range	0.04" – 0.2" [1 – 5 mm]	
• Mounting Clip Screw Torque Range	21 – 28 oz-in [0.15 – 0.2 Nm]	
• Depth from bezel rear with options Module	2.295" [58.3 mm]	
• Weight	5.82 oz. (165 g)	

NOTE: The environmental specifications for the panels shown above are also applicable for the *C-more* Micro-Graphic Accessories shown later in this section of the catalog.

Supported Protocols / Drivers	
Serial - Panel port1 or port2*	***Serial - Panel port2 only****
AutomationDirect Productivity Series	Allen-Bradley DF1 Full Duplex
AutomationDirect CLICK	Allen-Bradley DF1 Half Duplex
AutomationDirect K-sequence	Allen-Bradley PLC5 DF1
AutomationDirect DirectNET	Allen-Bradley DH485
AutomationDirect Modbus	GE SNPX (90/30, 90/70, Micro 90, VersaMax Micro)
Modicon Modbus RTU	Mitsubishi FX
Entivity Modbus RTU	Mitsubishi Q & QnA
GS Drives	Omron Host Link (C200 Adapter, C500)
SOLO Temperature Controller	Omron FINS Serial (CJ1, CS1)
	Siemens PPI (S7-200 CPU)

***Note: Serial port 2 requires the use of EA-MG-SP1 adapter or C-more 3" Micro-Graphic panels**

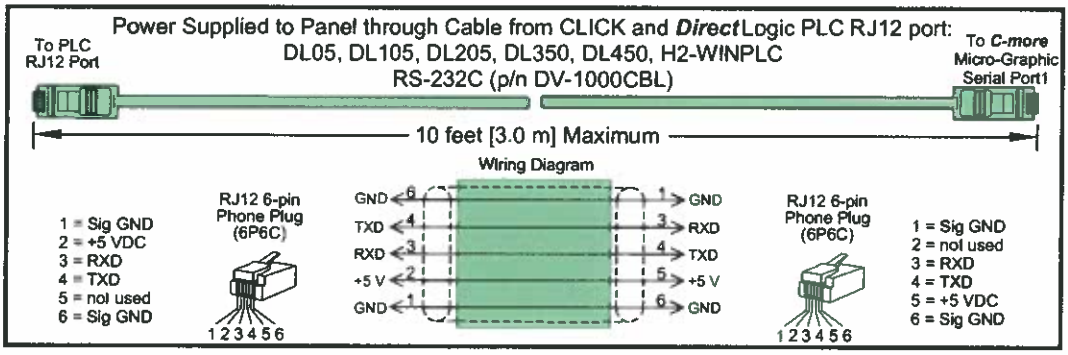
For a list of supported protocols and cabling options refer to the 3" *C-more* Micro-Graphic Protocols and cabling chart starting on page 11-23.

C-more 3" Micro-Graphic Power Connection Wiring

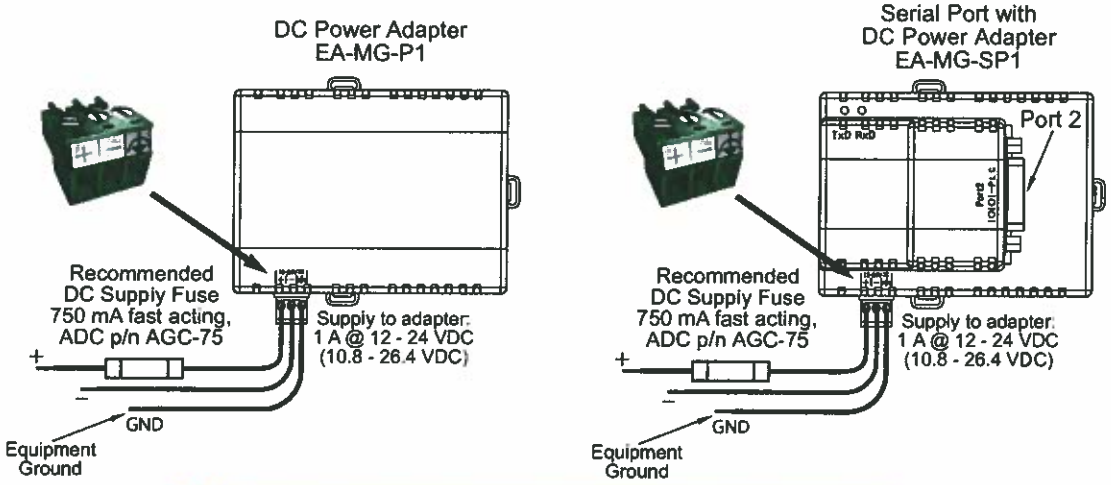
Providing power to the touch panel

- The ***C-more*** 3" Micro-Graphic panel is powered during programming from the PC through the USB to RS-232 Programming Cable Assembly, EA-MG-PGM-CBL.
- During operation, the ***C-more*** Micro-Graphic panel is powered from an ***AutomationDirect*** CLICK, ***Direct***LOGIC PLC or Productivity PAC RJ12 serial communications port by using the DV-1000CBL communications cable.
- Or install either the DC Power Adapter, EA-MG-P1, or the Serial Port with DC Power Adapter, EA-MG SP1, to the rear of the panel and supply the adapter from a 12-24 VDC power source.

3" Panel powered from AutomationDirect CLICK or *Direct*LOGIC PLC via communications cable

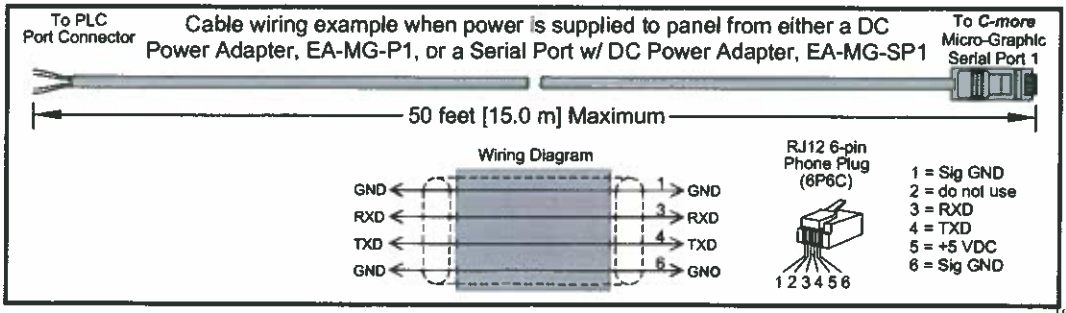


3" panel powered from a DC power adapter – wiring diagram



NOTE: Recommended DC power supply to power either DC Power Adapter, *AutomationDirect* Part No. PSP24-024S or PSP24-024C.

Maximum communication cable length when 3" panel is powered from an optional DC Power Adapter



C-more 3" Micro-Graphic PLC Connections

Cabling requirements

The following cables can be used when connecting the *C-more* 3" Micro-Graphic panel's built-in RJ12 serial port (Port1) with the Productivity Series, CLICK, DL05, DL06, DL105, DL205, D3-350 and DL405 CPUs.

- DV-1000CBL — connects to Productivity Series, CLICK, DL05, DL06, DL105, DL205, D3-350 and D4-450 phone jack.
- D4-1000CBL — connects to all DL405 CPU 15-pin ports.

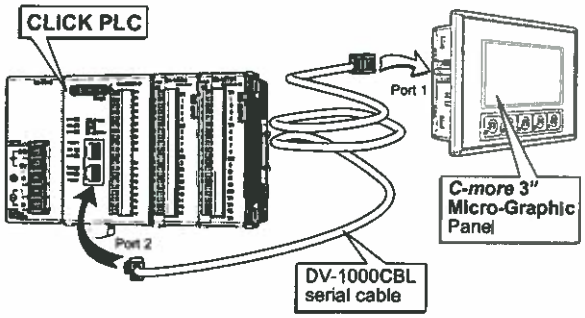
A maximum cable length of **10 feet** between the *C-more* Micro-Graphic panel and the PLC is recommended when powering the panel from the PLC.

The Serial Port with DC Power Adapter module, EA-MG-SP1, can be used with the C-more 3" Micro-Graphic panels if the application requires the use of RS-422 or RS-485. The serial port on the adapter, designated as port 2, can also be wired for RS-232. The use of the adapter permits greater cable length. See the Communication Protocols & Cabling Charts in this catalog section for details on the selection of various controllers, protocols, and connectivity.

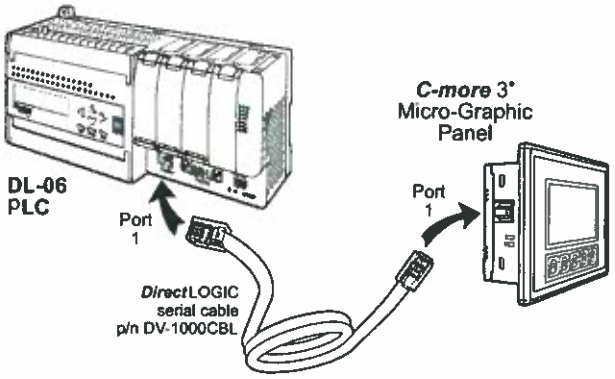
Drivers for your Controller

- AutomationDirect Productivity Series
- AutomationDirect CLICK (Modbus)
- ***Direct***LOGIC K-sequence, *Direct*LOGIC *Direct*NET, ***Direct***LOGIC Modbus (Koyo Addressing)
- Modbus RTU
- Allen Bradley DF1 Full Duplex, Allen Bradley DF1 Half Duplex, Allen Bradley PLC5 DF1, AB DH485
- Omron Host Link (C200 Adapter, C500) Omron FINS serial (CJ1, CS1)
- GE SNPX (90/30, 90/70, Micro 90, VersaMax Micro)
- Mitsubishi Melsec FX
- Siemens PPI
- Entivity Modbus RTU
- GS Drives
- SOLO Temperature Controllers

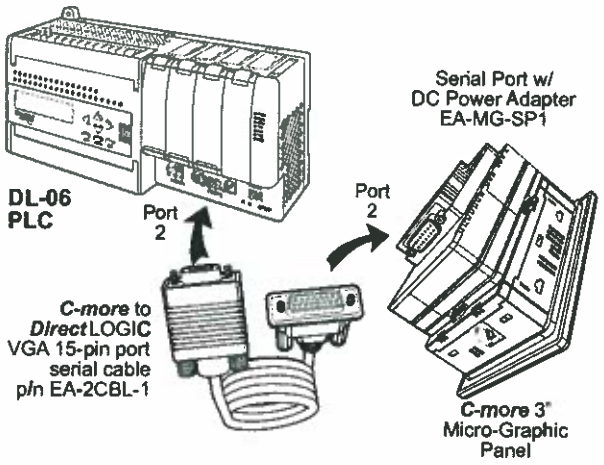
C-more 3" Micro-Graphic Port 1 to CLICK PLC Port 2



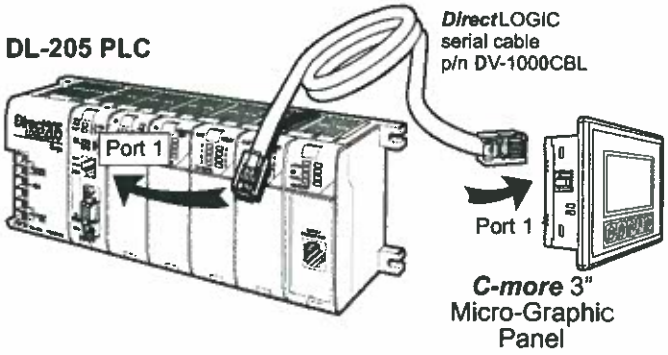
C-more 3" Micro-Graphic Port 1 to DL06 PLC Port 1



C-more 3" Micro-Graphic Port 2 to DL06 PLC Port 2



C-more 3" Micro-Graphic Port 1 to DL205 PLC Port 1



C-more 3" Micro-Graphic Communication Protocols & Cabling Chart

Contoller Compatibility & Connection Chart

PLC			C-more Micro-Graphic Panel.							
			Panel to PLC Cabling Components Required for Specific Port and Protocol being used.							
			PLC Port Powered Powered with 5 VDC from the connected PLC's comm. port.		**DC Power Adapter** Powered from an external 24 VDC source using the DC Power Adapter, EA-MG-P1.		**Serial Port with DC Power Adapter** Powered from an external 24 VDC source using the Serial Port with DC Power Adapter, EA-MG-SP1.			
			Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using adapter's serial Port 2 15-pin D-sub - female	
Family	CPU	Port & Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type
CLICK	all versions	Port 1 RJ12 - 6 pin	Automation Direct Modbus (CLICK)	DV-1000CBL RS-232	Automation Direct Modbus (CLICK)	DV-1000CBL RS-232	Automation Direct Modbus (CLICK)	DV-1000CBL RS-232	Automation Direct Modbus (CLICK)	EA-2CBL RS-232
		Port 2 RJ12 - 6 pin								
	Analog CPUs	Port 3 Terminal block - 3-pin		N/A		N/A		N/A		See Note RS-485
Productivity Series	all versions	RS-232 RJ12 - 6 pin	Automation Direct Productivity3000 Serial (P3-550)	DV-1000CBL	Automation Direct Productivity3000 Serial (P3-550)	DV-1000CBL RS-232	Automation Direct Productivity3000 Serial (P3-550)	DV-1000CBL RS-232	Automation Direct Productivity3000 Serial (P3-550)	DV-1000CBL RS-232
		RS-485 Port Term block 3-pin		N/A		N/A		N/A		See Note RS-485
DirectLOGIC DL05 (see D0-DCM under DL06)	all versions	Port 1 RJ12 - 6 pin	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	EA-2CBL RS-232
		Port 2 RJ12 - 6 pin								
DirectLOGIC DL06	all versions	Port 1 RJ12 - 6 pin	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	EA-2CBL RS-232
										EA-2CBL-1 RS-232
		Port 2 DB15HD (female)		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		See Note RS-422
									Modbus RTU	See Note RS-485 Modbus only
	D0-DCM	Port 1 RJ12 - 6 pin	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	EA-2CBL RS-232
										EA-2CBL-1 RS-232
		Port 2 DB15HD (female)		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		See Note RS-422
									Modbus RTU	See Note RS-485 Modbus only
DirectLOGIC DL105	all versions	Port 1 RJ12 - 6 pin	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	EA-2CBL RS-232

Note: See the *C-more* Micro-Graphic Hardware User Manual, Chapter 6: PLC Communications, for wiring diagrams that the user can use to construct their own cables. Available for download at www.automationdirect.com. PLC Compatibility & Connection Chart continued on next page.

C-more 3" Micro-Graphic Communication Protocols & Cabling Chart (cont'd)

Controller Compatibility & Connection Chart

PLC			C-more Micro-Graphic Panel							
			Panel to PLC Cabling Components Required for Specific Port and Protocol being used.							
			PLC Port Powered Powered with 5 VDC from the connected PLC's comm. port.		**DC Power Adapter** Powered from an external 24 VDC source using the DC Power Adapter, EA-MG-P1.		**Serial Port with DC Power Adapter** Powered from an external 24 VDC source using the Serial Port with DC Power Adapter, EA-MG-SP1.			
			Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using adapter's serial Port 2 15-pin D-sub - female	
Family	CPU	Port & Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type
DirectLOGIC DL205	D2-230	Port 1 RJ12 - 6 pin	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	EA-2CBL RS-232
	D2-240	Port 1 RJ12 - 6 pin	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	DV-1000CBL RS-232	K-sequence	EA-2CBL RS-232
		Port 2 RJ12 - 6 pin	K-sequence, DirectNET		K-sequence, DirectNET		K-sequence, DirectNET		K-sequence, DirectNET	
	D2-250-1	Port 1 RJ12 - 6 pin	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	EA-2CBL RS-232
		Port 2 DB15HD (female)		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		EA-2CBL-1 RS-232
										See Note RS-422
	D2-260	Port 1 RJ12 - 6 pin	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL RS-232	K-sequence, DirectNET, Modbus RTU	EA-2CBL RS-232
		Port 2 DB15HD (female)		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		DV-1000CBL + FA-15HD RS-232		EA-2CBL-1 RS-232
										See Note RS-422
									Modbus RTU	See Note RS-485 Modbus only
	D2-DCM	Port 1 DB 25 pin (female)	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	DirectNET	EA-4CBL-2 RS-232
										See Note RS-422
	WINPLC	Port 1 RJ12 - 6 pin	Modbus RTU	DV-1000CBL RS-232	Modbus RTU	DV-1000CBL RS-232	Modbus RTU	DV-1000CBL RS-232	Modbus RTU	EA-2CBL RS-232
DirectLOGIC DL305	D3-330 or D3-340	D3-232-DCU DB 25 pin .(female)	N/A		DirectNET	See Note RS-232	DirectNET	See Note RS-232	DirectNET	EA-4CBL-2 RS-232
		D3-422-DCU DB 25 pin (female)	N/A		N/A		N/A		DirectNET	See Note RS-422
	D3-340	Port 1 RJ11 - 4 pin	N/A		DirectNET	DP-3CBL-1 RS-232	DirectNET	OP-3CBL-1 RS-232	DirectNET	EA-3CBL RS-232
		Port 2 RJ11 - 4 pin	N/A		DirectNET, Modbus RTU		DirectNET, Modbus RTU		DirectNET, Modbus RTU	
	D3-350	Port 1 RJ12 - 6 pin	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	EA-2CBL RS-232
		Port 2 DB 25 pin (female)	N/A		K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	EA-4CBL-2 RS-232
										See Note RS-422
	D3-DCM D3-350 only	Port 1 DB 25 pin (female)	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	DirectNET	EA-4CBL-2 RS-232
										See Note RS-422

Note: See the *C-more* Micro-Graphic Hardware User Manual, Chapter 6: PLC Communications, for wiring diagrams that the user can use to construct their own cables. Available for download at www.automationdirect.com. PLC Compatibility & Connection Chart continued on next page.

C-more 3" Micro-Graphic Communication Protocols & Cabling Chart (cont'd)

Controller Compatibility & Connection Chart

PLC			C-more Micro-Graphic Panel							
			Panel to PLC Cabling Components Required for Specific Port and Protocol being used.							
			PLC Port Powered Powered with 5 VDC from the connected PLC's comm. port.		DC Power Adapter Powered from an external 24 VDC source using the DC Power Adapter, EA-MG-P1.		Serial Port with DC Power Adapter Powered from an external 24 VDC source using the Serial Port with DC Power Adapter, EA-MG-SP1.			
			Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using adapter's serial Port 2 15-pin D-sub - female	
Family	CPU	Port & Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type
DirectLOGIC DL405	D4-430	Port 0 DB 15 pin (female)	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	EA-4CBL-1 RS-232
		Port 1 DB 25 pin (female)	N/A		K-sequence, DirectNET	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET	EA-4CBL-2 RS-232 See Note RS-422
	D4-440	Port 0 DB 15 pin (female)	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	EA-4CBL-1 RS-232
		Port 1 DB 25 pin (female)	N/A		K-sequence, DirectNET	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET	EA-4CBL-2 RS-232 See Note RS-422
	D4-450	Port 0 DB 15 pin (female)	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	D4-1000CBL or DV-1000CBL & FA-CABKIT RS-232	K-sequence	EA-4CBL-1 RS-232
		Port 1 DB 25 pin (female)	N/A		K-sequence, DirectNET, Modbus RTU	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET, Modbus RTU	DV-1000CBL & FA-CABKIT RS-232	K-sequence, DirectNET, Modbus RTU	EA-4CBL-2 RS-232 See Note RS-422
		Port 2 RJ12 - 6 pin	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	DV-1000CBL RS-232	K-sequence, DirectNET	EA-2CBL RS-232
		Port 3 DB 25 pin (female)	N/A		N/A		N/A		K-sequence, DirectNET, Modbus RTU	See Note RS-422
	D4-DCM	Port 1 DB 25 pin (female)	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	K-sequence, DirectNET, Modbus RTU	See Note RS-232	DirectNET	EA-4CBL-2 RS-232 See Note RS-422
SOLO	N/A	Data +/- terminals	N/A		N/A		N/A		SOLO Temperature Controller	See Note RS-485
GS Drives	N/A	RS-485 Interface	N/A		N/A		N/A		GS Drives Serial GS Drives TCP/IP (GS-EDRV)	See Note RS-485

Note: See the *C-more* Micro-Graphic Hardware User Manual, Chapter 6: PLC Communications, for wiring diagrams that the user can use to construct their own cables. Available for download at www.automationdirect.com. PLC Compatibility & Connection Chart continued on next page.

C-more 3" Micro-Graphic Communication Protocols & Cabling Chart (cont'd)

Controller Compatibility & Connection Chart

PLC			C-more Micro-Graphic Panel							
			Panel to PLC Cabling Components Required for Specific Port and Protocol being used.							
			PLC Port Powered Powered with 5 VDC from the connected PLC's comm. port.		**DC Power Adapter** Powered from an external 24 VDC source using the DC Power Adapter, EA-MG-P1.		**Serial Port with DC Power Adapter** Powered from an external 24 VDC source using the Serial Port with DC Power Adapter, EA-MG-SP1.			
			Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using panel's RJ12 port 1		Using adapter's serial Port 2 15-pin D-sub - female	
Family	**CPU**	**Port & Type**	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type	Protocol(s) Supported	Components & Network Type
Allen-Bradley MicroLogix	1000, 1100, 1200, 1500	8-pin mini-din port							DF1 Full Duplex DF1 Half Duplex	EA-MLOGIX-CBL RS-232
		RJ45 8-pin phone plug							DH485/AIC/AIC+	EA-DH485-CBL RS-232
Allen-Bradley SLC500	5/03, 5/04, 5/05	9-pin D-sub port							DF1 Full Duplex DF1 Half Duplex	EA-SLC-232-CBL RS-232
	5/01, 5/02, 5/03	RJ45 8-pin phone plug							DH485/AIC/AIC+	EA-DH485-CBL RS-232
Allen-Bradley ControlLogix	all	9-pin D-sub port							DF1 Full Duplex DF1 Half Duplex	EA-SLC-232-CBL RS-232
Allen-Bradley CompactLogix	all	9-pin D-sub port							DF1 Full Duplex DF1 Half Duplex	EA-SLC-232-CBL RS-232
Allen-Bradley FlexLogix	all	9-pin D-sub port							DF1 Full Duplex DF1 Half Duplex	EA-SLC-232-CBL RS-232
Allen-Bradley PLC5	all	25-pin D-sub port							DF1 Full Duplex	EA-PLC5-232-CBL RS-232
		RJ45 8-pin phone plug							DH485/AIC/AIC+	EA-DH485-CBL RS-232
GE	90/30	15-pin D-sub port							SNPX	EA-90-30-CBL RS-422
	Micro 90, VersaMax Micro	RJ45 Port 1								See Note RS-232
		15-pin D-sub port Port 2								EA-90-30-CBL RS-422
Mitsubishi	Melsec FX Series	25-pin D-sub port							CPU Direct	EA-MITSU-CBL RS-422
		8-pin mini-din port								EA-MITSU-CBL-1 RS-422
	Q / QnA	9-pin D-sub port							Q / QnA	See Note RS-232
		6-pin mini-din port								See Note RS-232
Omron	C200 (Adapter), C500	25-pin D-sub port							Host Link	EA-OMRON-CBL RS-232
	CJ1, CS1, CQM1, CPM1, CPM2, C200	9-pin D-sub port							FINS	See Note RS-232
Modicon	984 CPU, Quantum 113 CPU, AEG Modicon Micro Series 110 CPU	varies							Modbus RTU	See Note RS-232
Siemens	S7-200 CPU	9-pin D-sub port 0 or 1							PPI	See Note RS-485

N/A (PLC Port Powered) — N/A (DC Power Adapter) — N/A (Serial Port with DC Power Adapter)

Note: See the *C-more* Micro-Graphic Hardware User Manual, Chapter 6: PLC Communications, for wiring diagrams that the user can use to construct their own cables. Available for download at www.automationdirect.com. Available cables with descriptions shown on the next page.

C-more 3" Micro-Graphic Communication Cables and Cable Kits

Cable Description	Cable Part Number	Price
Cables for direct connect to panel's serial Port1 (Panel powered from PLC's serial port.)		
AutomationDirect Productivity Series, AutomationDirect CLICK, *Direct*LOGIC PLC RJ-12 port, DL05, DL06, DL105, DL205, D3-350, D4-450 & H2-WinPLC (RS-232C).	***DV-1000CBL***	<--->
*Direct*LOGIC DL405 PLC 15-pin D-sub port, DL405 (RS-232C).	***D4-1000CBL***	<--->
*Direct*LOGIC (VGA Style) 15-pin port, DL06, D2-250 (250-1), D2-260 (RS-232C). **Use with DV-1000CBL cable.**	***FA-15HD***	<--->
*Direct*LOGIC PLC 15-pin D-sub port, DL405 (RS-232C). **Use with DV-1000CBL cable.**	***FA-CABKIT***	<--->
*Direct*LOGIC PLC RJ-11 port, D3-340 (RS-232C).	***OP-3CBL-1***	<--->
Cables used with serial Port2		
AutomationDirect Productivity Series, AutomationDirect CLICK, *Direct*LOGIC PLC RJ-12 port, DL05, DL06, DL105, DL205, D3-350, D4-450 & H2-WinPLC (RS-232C).	***EA-2CBL***	<--->
*Direct*LOGIC (VGA Style) 15-pin port, DL06, D2-250 (250-1), D2-260 (RS-232C).	***EA-2CBL-1***	<--->
*Direct*LOGIC PLC RJ-11 port, D3-340 (RS-232C).	***EA-3CBL***	<--->
*Direct*LOGIC DL405 PLC 15-pin D-sub port, DL405 (RS-232C).	***EA-4CBL-1***	<--->
*Direct*LOGIC PLC 25-pin D-sub port, DL405, D3-350, DL305 DCU and all DCM's (RS-232C).	***EA-4CBL-2***	<--->
Allen-Bradley MicroLogix 1000, 1100, 1200 & 1500 (RS-232C)	***EA-MLOGIX-CBL***	<--->
Allen-Bradley SLC 5-03/04/05, ControlLogix, CompactLogix, FlexLogix DF1 port (RS-232C)	***EA-SLC-232-CBL***	<--->
Allen-Bradley PLC-5 DF1 port (RS-232C)	***EA-PLC5-232-CBL***	<--->
Allen-Bradley MicroLogix, SLC-5-01/02/03, PLC5 DH485 port (RS-232C)	***EA-DH485-CBL***	<--->
GE 90/30 and 90/70, Micro 90, VersaMax Micro (Port 2) 15-pin D-sub port (RS-422A)	***EA-90-30-CBL***	<--->
MITSUBISHI FX Series 25-pin port (RS-422A)	***EA-MITSU-CBL***	<--->
MITSUBISHI FX Series 8-pin mini-DIN (RS-422A)	***EA-MITSU-CBL-1***	<--->
OMRON Host Link C200 Adapter, C500 (RS-232C)	***EA-OMRON-CBL***	<--->

DV-1000CBL

D4-1000CBL

OP-3CBL-1

FA-15HD

FA-CABKIT

EA-2CBL-1

EA-2CBL

EA-4CBL-1

EA-3CBL

EA-MLOGIX-CBL

EA-4CBL-2

EA-PLC5-232-CBL

EA-SLC-232-CBL

EA-DH485-CBL

EA-90-30-CBL

EA-MITSU-CBL

EA-MITSU-CBL-1

EA-OMRON-CBL

C-more 3" Micro-Graphic Panel Accessories

8-button Keypad Bezel

The 8-button keypad bezel can be used with both the touch and non-touch **C-more** 3" Micro-Graphic panels. The keypad includes four directional arrow cursor buttons, and one each of an ESCAPE, MENU, CLEAR and ENTER button. The keypad is intended to be used with the numeric entry object (Style 3) to allow changing of a value, and can also be used to navigate & select objects when using the non-touch panel version.The keypad bezel is designed for easy drop-in of a **C-more** 3" Micro-Graphic panel. No panel configuration required.

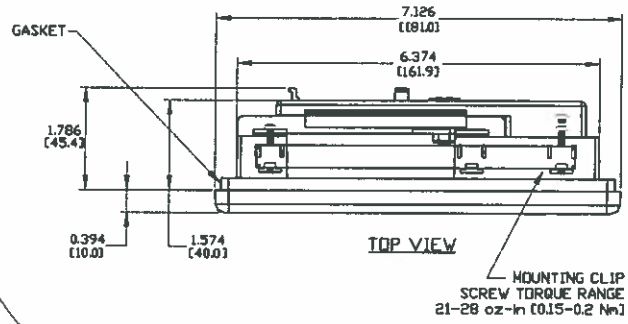
Part No. EA-MG-BZ1

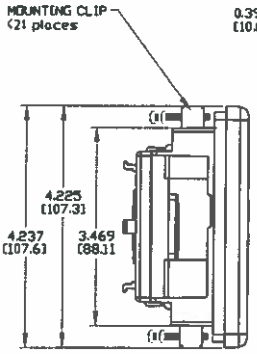
<---->

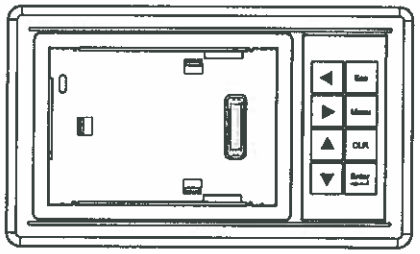
Four directional cursor buttons, and ESC, MENU, CLEAR and ENTER buttons.

Dimensions

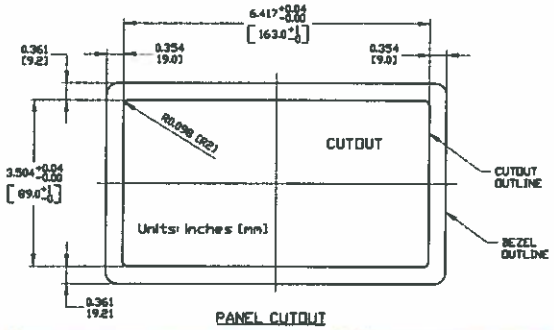
Units: inches [mm]



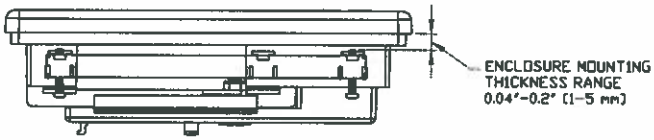




Panel Cutout



Panel Thickness



8-Button Keypad Bezel Specifications	
Part Number	EA-MG-BZ1
General	
• C-more Micro-Graphic Panels Supported	EA1-S3ML, EA1-S3MLW, EA1-S3ML-N, EA1-S3MLW-N
• Connection	Connects with expansion connector on the rear of a **C-more** 3" Micro-Graphic panel. An expansion connector is also located on the rear of the keypad bezel to allow the EA-MG-P1 DC Power Adapter, or the EA-MG-SP1 Serial Port with DC Power Adapter to be attached.
• Power Consumption	None
• Keypad Button Life	Minimum of 500,000 cycles
• Enclosure Mounting	(2) mounting clips, EA-MG-BZ1-BRK, included.
	Note: The **C-more** 3" Micro-Graphic panel is installed into the keypad bezel using the EA-MG-S3ML-BRK mounting clips that are supplied with the panel.
Physical	
• Dimensions	7.126" (W) x 4.225" (H) x 2.180" (D) [181.0 mm x 107.3 mm x 55.4 mm]
• Weight	7.05 oz. [200 g]
• Environmental	See environmental specifications at the beginning of this catalog section.

C-more 3" Micro-Graphic Panel Accessories

20-Button Keypad Bezel

The 20-button keypad bezel can be used with both the touch and non-touch **C-more** 3" Micro-Graphic panels. The keypad includes four directional arrow cursor buttons, a full numeric keypad, and one each of an ESCAPE, MENU, CLEAR and ENTER button. The keypad is intended to be used with the numeric entry object (Style 3) to allow changing of a value, and can also be used to navigate & select objects when using the non-touch panel version. The numeric buttons can be used to enter a new value. The keypad bezel is designed for easy drop-in of a **C-more** 3" Micro-Graphic panel. No panel configuration required.

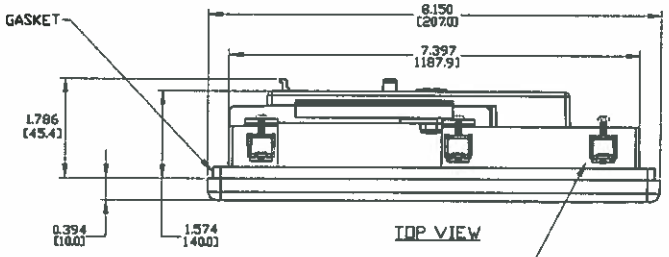
Part No. EA-MG-BZ2

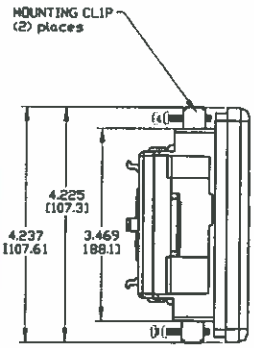
<--->

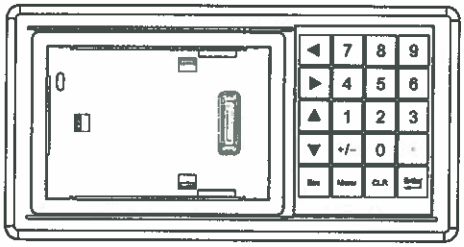
Four directional cursor buttons, numeric buttons, and ESC, MENU, CLEAR and ENTER buttons.

Dimensions

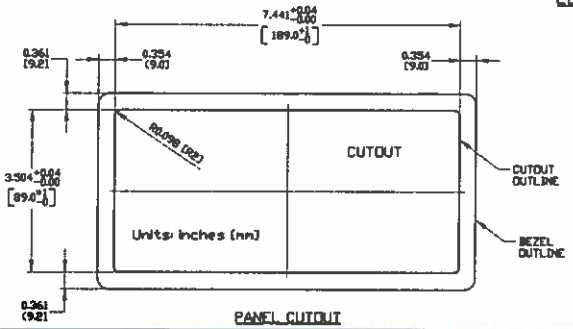
Units: inches [mm]



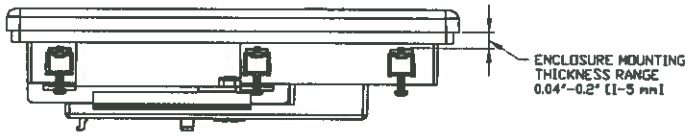




Panel Cutout



Panel Thickness



20-Button Keypad Bezel Specifications	
Part Number	EA-MG-BZ2
General	
• **C-more Micro-Graphic Panels Supported**	EA1-S3ML, EA1-S3MLW, EA1-S3ML-N, EA1-S3MLW-N
• **Connection**	Connects with expansion connector on the rear of a 3" **C-more** Micro-Graphic panel. An expansion connector is also located on the rear of the keypad bezel to allow the EA-MG-P1 DC Power Adapter, or the EA-MG-SP1 Serial Port with DC Power Adapter to be attached.
• **Power Consumption**	None
• **Keypad Button Life**	Minimum of 500,000 cycles
• **Enclosure Mounting**	(6) mounting clips, EA-MG-BZ2-BRK, included.
	Note: The **C-more** 3" Micro-Graphic panel is installed into the keypad bezel using the EA-MG-S3ML-BRK mounting clips that are supplied with the panel.
Physical	
• **Dimensions**	8.150" (W) x 4.225" (H) x 2.180" (D) [207.0 mm x 107.3 mm x 55.4 mm]
• **Weight**	7.40 oz. [210 g]
Environmental	See environmental specifications at the beginning of this catalog section.

C-more 3" Micro-Graphic Panel Accessories

DC Power Adapter

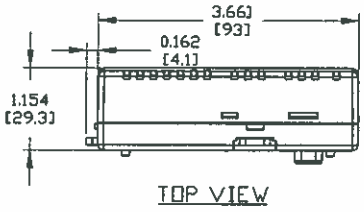
The ***C-more*** 3" Micro-Graphic panel is designed to use the 5 VDC power that is available from an RJ12 serial communications port found on some ***AutomationDirect*** PLC's. However, for other devices that do not supply power through their serial cammun cations port, the EA-MG-P1 DC power adapter or EA-MG-SP1 serial port with DC power adapter must be used. Both adapters require power from a 12-24 VDC source. The EA-MG-P1 DC Power Adapter for ***C-more*** 3" Micro-Graphic panels is designed to easily snap on to the rear of a ***C-more*** 3" Micro-Graphic panel or the rear of an optional Keypad Bezel being used with a ***C-more*** 3" Micro-Graphic panel.

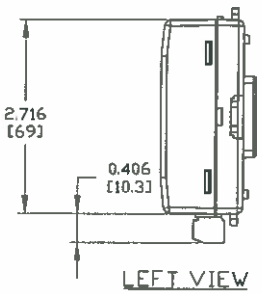
Part No. EA-MG-P1

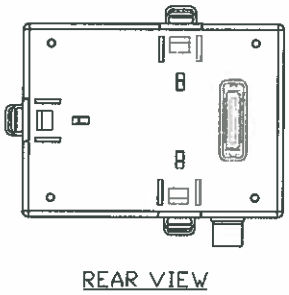
<--->

Dimensions

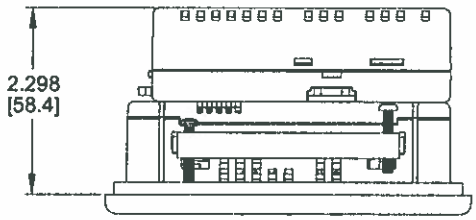
Units: inches [mm]



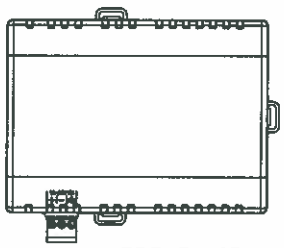




Panel overall depth with adapter installed



Units: inches [mm]



DC Power Adapter Specifications	
Part Number	**EA-MG-P1**
Electrical	
• Input Voltage	12-24 VDC
• Input Voltage Range	10.8-26.4 VDC
• Power Consumption	100 mA @ 24 VDC
• Maximum Power	2.90 Watts
• Maximum Inrush Current	5 A @ 500 µs with 12 VDC applied, 10 A @ 500 µs with 24 VDC applied
• Recommended Fuse	Type AGC fast acting glass fuse, 750 mA, 250 VAC, ADC #AGC-75
• Connector Type	3-pin screw type terminal block
Physical	
• Dimensions	3.823" (W) x 3.284" (H) x 1.331" (D) [97.1 mm x 83.4 mm x 33.8 mm]
• Weight	2.8 oz. [80 g]
Environmental	See environmental specifications at the beginning of this catalog section.

NOTE: Recommended DC power supply to power either DC Power Adapter, *AutomationDirect* Part No. PSP24-024S or PSP24-024C.

C-more 3" Micro-Graphic Panel Accessories

Serial Port with DC Power Adapter

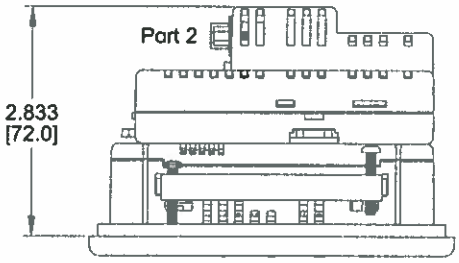
The **C-more** 3" Micro-Graphic panel is designed to use the 5 VDC power that is available from an RJ12 serial communications port of some ***AutomationDirect*** PLC's. However, for other devices that do not supply power through their serial communications port, the EA-MG-P1 DC power adapter or EA-MG-SP1 serial port with DC power adapter must be used. The EA-MG SP1, with D-Sub 15-pin RS-232/RS-422/485 serial port, can be used to connect to a PLC using RS-232 or RS-422/485. The adapter requires power from a 12-24 VDC source. This optional Serial Port with DC Power Adapter for **C-more** 3" Micro-Graphic panels is designed to easily snap on to the rear of a **C-more** 3" Micro-Graphic panel or the rear of an optional Keypad Bezel being used with a **C-more** 3" Micro-Graphic panel.

Part No. EA-MG-SP1

Supports:
RS-232,
RS-485,
& RS-422

<---->

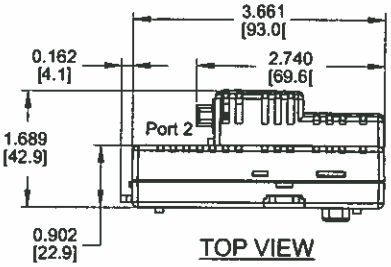
Panel overall depth with adapter installed



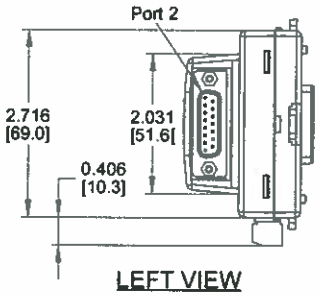
Units: inches [mm]

Dimensions

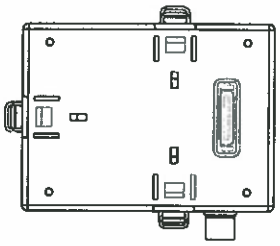
Units: inches [mm]



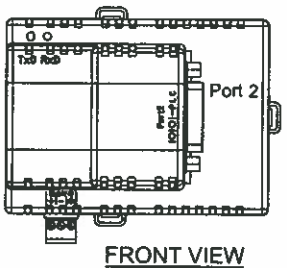
TOP VIEW



LEFT VIEW



REAR VIEW



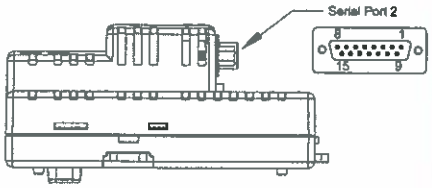
FRONT VIEW

Serial Port w/ DC Power Adapter Specifications	
Part Number	EA-MG-SP1
Serial PLC Interface	
• ***Interface Standard***	RS-232 & RS-485/422
• ***Adjustable Settings from Software (Dependent on PLC Protocol)***	Baud rate: 9600, 19200 or 38400 bits/sec Data bits: 7/8 bits Parity: None, Odd/Even Stop bits: 2/1 bits
• ***Connector Type***	15-pin D-sub connector (female)
Electrical	
• ***Input Voltage***	12-24 VDC
• ***Input Voltage Range***	10.8-26.4 VDC
• ***Power Consumption***	100 mA @ 24 VDC
• ***Maximum Power***	2.90 Watts
• ***Maximum Inrush Current***	5 A @ 500 µs with 12 VDC applied, 10 A @ 500 µs with 24 VDC applied
• ***Recommended Fuse***	Type AGC fast acting glass fuse, 750 mA, 250 VAC, ADC #AGC-75
• ***Connector Type***	3-pin screw type terminal block
Physical	
• ***Dimensions***	3.823" (W) x 3.284" (H) x 1.331" (D) [97.1 mm x 83.4 mm x 33.8 mm]
• ***Weight***	2.8 oz. [80 g]
• ***Environmental***	See environmental specifications at the beginning of this catalog section.

NOTE: Recommended DC power supply to power either DC Power Adapter, *AutomationDirect* Part No. PSP24-024S or PSP24-024C.

PLC Serial Communications Port 2

Pin	Signal	Pin	Signal	Pin	Signal
1	Frame GND	6	LE	11	TXD+ (422/485)
2	TXD (232C)	7	CTS (232C)	12	TXD- (422/485)
3	RXD (232C)	8	RTS (232C)	13	Term. Resistor
4	Future	9	RXD+ (422/485)	14	do not use
5	Logic GND	10	RXD- (422/485)	15	do not use



C-more 3" Micro-Graphic Panel Accessories

Clear Screen Overlay

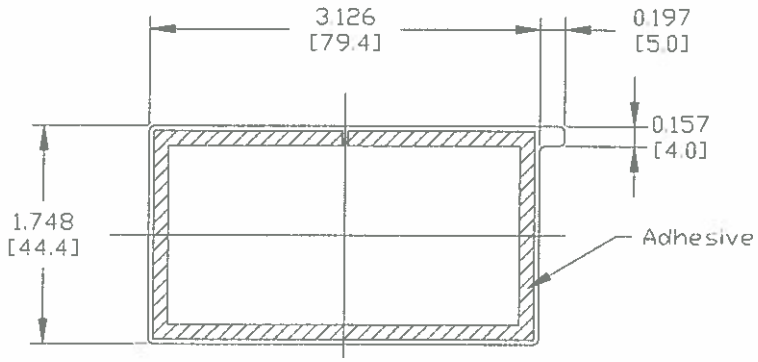
Optional clear screen overlay used to protect *C-more* 3" Micro-Graphic displays from minor scratches and wear. Package contains 5 clear screen overlays.

Part No. EA-MG-COV-CL

<--->

Dimensions

Units: inches [mm]



Clear screen overlay installation

Step 1

Remove the overlay from the package

Step 2

Remove the paper backing from the overlay

Step 3

Align the overlay with the screen and press the adhesive firmly into place

Step 4

Remove the protective film*

***Note: The overlay cover ships with a thin protective film on the face that should be carefully removed after installation.**

C-more 3" Micro-Graphic Replacement Parts

The optional replacement parts can be used to replace damaged, worn or lost C-more 3" Micro-Graphic panel components.

Replacement parts at a glance:

Part Number	Description	Price
EA-MG-S3ML-BRK	Replacement mounting clip for C-more 3" Micro-Graphic panels (pk of 2)	<-->
EA-MG-BZ1-BRK	Replacement mounting clip for C-more 3" Micro-Graphic keypad bezel p/n EA-MG-BZ1 (pk of 2)	<-->
EA-MG-BZ2-BRK	Replacement mounting clip for C-more Micro-Graphic keypad bezel p/n EA-MG-BZ2 and C-more 6" Micro-Graphic panels and bezels (pk of 8)	<-->
EA-MG-DC-CON	Replacement adapter DC power connector for optional p/n EA-MG-P1 and p/n EA-MG-SP1 power adapters used with C-more 3" Micro-Graphic panels and C-more 6" Micro-Graphic panels and bezels (pk of 5)	<-->
EA-MG-S3ML-GSK	Replacement mounting gasket for C-more 3" Micro-Graphic panels	<-->
EA-MG-BZ1-GSK	Replacement mounting gasket for C-more 3" Micro-Graphic keypad bezel p/n EA-MG-BZ1	<-->
EA-MG-BZ2-GSK	Replacement mounting gasket for C-more 3" Micro-Graphic keypad bezel p/n EA-MG-BZ2	<-->
EA-MG-S3ML-FKL	Replacement function key label insert for C-more 3"Micro-Graphic panels (pk of 10; 5 blank, 5 F1-F5)	<-->

Panel Mounting Clips
Part No. EA-MG-S3ML-BRK

(pk of 2)

Keypad Bezel 1 Mounting Clips
Part No. EA-MG-BZ1-BRK

(pk of 2)

Keypad Bezel 2 Mounting Clips
Part No. EA-MG-BZ2-BRK

(pk of 8)

DC Power Connector
Part No. EA-MG-DC-CON

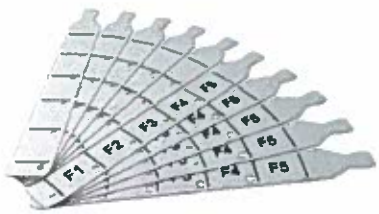
(pk of 5)

3" Panel Gasket
Part No. EA-MG-S3ML-GSK

3" Keypad Bezel 1 Gasket
Part No. EA-MG-BZ1-GSK

3" Keypad Bezel 2 Gasket
Part No. EA-MG-BZ2-GSK

3" Panel Function Keys Label Inserts
Part No. EA-MG-S3ML-FKL



(pk of 10 - 5 blank, 5 F1-F5)

C-more Micro-Graphic Programming Software

FREE software!

C-more Micro-Graphic Programming Software can be downloaded at no charge or a CD version may be purchased by ordering EA-MG-PGMSW. The software requires a USB port on your PC to connect to the **C-more** Micro-Graphic panel. Software Help Files are included in the download. This software programs all the **C-more** Micro-Graphic panels (does not program the **C-more** 6" through 15" touch panels).

Note: This software is used to program C-more Micro-Graphic panels only.
Part Numbers: EA1-S3ML, EA1-S3ML-N, EA1-S3MLW, EA1-S3MLW-N, EA1-T4CL, EA1-S6ML, EA1-S6MLW, EA1-T6CL

NOTE: Software and Firmware Version 3.0 or later is required with model EA1-T4CL.
Software and Firmware Version 2.60 or later is required with model EA1-T6CL.
Software and Firmware Version 2.0 or later is required with models EA1-S6ML and EA1-S6MLW.
Software and Firmware Version 1.5 or later is required with models EA1-S3MLW and EA1-S3MLW-N.
Available for free download at *www.automationdirect.com*.

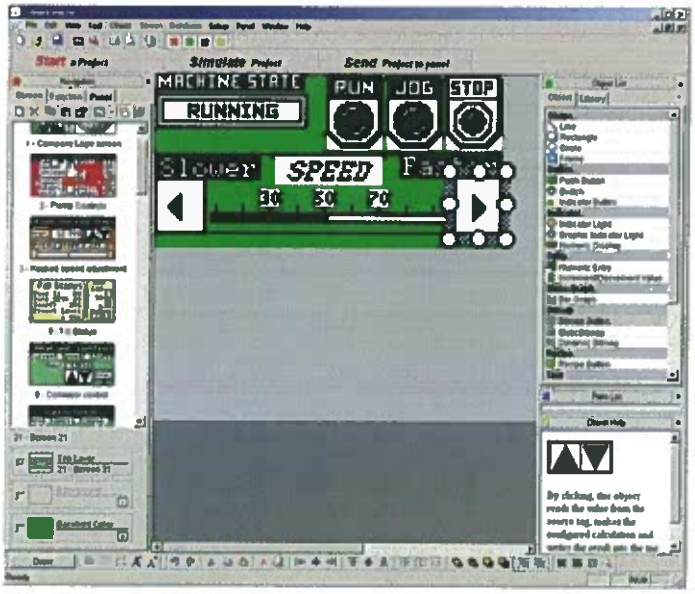
C-more Micro-Graphic Programming Software is a spin-off of its powerful sibling **C-more** Touch Panel. It offers very high end features designed to reduce your configuration time. Simply drag and drop the objects from the object list (right side of screen) onto the the screen construction area. Then configure your PLC tags and click on the objects you wish to use. Use the built-in simulator to review your work on your PC before ever downloading your project! The time saving benefits of the **C-more** Micro-Graphic configuration software could easily pay for the panel. Check out **www.C moreMicro.com** to download a free version.

Built-in project simulator

- Runs your project on your PC
- Test all of your screens before downloading
- Time savings pays for the panel
- Version 2.5 or later - Simulate function keys and keypad bezel.

Built-in user object/screen libraries

Save time by re-using your custom objects and screens.



Thumbnail project preview pane

Helps keep track of multi-screen projects.

Scrolling object selection window

Lets you find the object you want fast. Just drag and drop it on the screen.

PC requirements

Following are the minimum system requirements for running **C-more** Micro-Graphic Programming Software, EA-MG-PGMSW, on a PC:

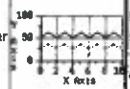
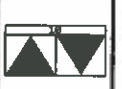
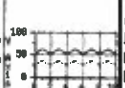
- Personal Computer with a 333 MHz or higher processor (CPU) clock speed recommended;
- Keyboard and Mouse or compatible pointing device
- Super VGA color video adapter and monitor with at least 800 x 600 pixels resolution (1024 x 768 pixels recommended) 64K color minimum
- 150 MB free hard-disk space
- 128 MB free RAM (512 MB recommended); 512 MB free RAM (1GB recommended) for Vista
- CD-ROM or DVD drive for installing software from the CD, or internet access to download free programming software
- USB port to use with an EA-MG-PGM-CBL, USB to RS232 Programming Cable Assembly for project transfer from the programming software to the panel
- Operating System - Windows® XP Home / Professional Edition Service Pack 2, Windows® 2000 with Service Pack 4, Windows® Vista or Windows® 7.

Scrolling help window

Gives you helpful information on each object

C-more Micro-Graphic Programming Software

C-more Micro-Graphic Panel Objects

Object	Graphic	Object	Graphic
The **Line** object, just like with drawing tools, allows the user to insert a straight line drawing into a project. When a Line is inserted into a project, a window opens to allow the user to setup all available parameters for the Line object. Some of the uses for Line Objects include but are not limited to adding callouts, pointers, or indicators.		The **Analog Meter** object is used to display the current value of a Tag Name.	
The **Rectangle** object, just like with drawing tools, allows the user to insert a drawing of a Rectangle as well as other geometric shapes into a project. When this object is inserted into a project, a window opens to allow the user to setup all available parameters for the Rectangle object.		The **Bar Meter** object is used to monitor up to two assigned Tag Names continuously. This object has various appearances depending upon the relative value of the tags. The Bar Meter can be used to create digital versions of level, current, and flow meters to name a few samples, or gauges that measure speed and other measurable data.	
The **Circle** object, just like with drawing tools, allows the user to insert a drawing of a Circle or ellipse shape into a project. When this object is inserted into a project, a window opens to allow the user to setup all available parameters for the Circle object.		The **Bitmap Button** object offers the ability to use a Bitmap graphic to perform the functions of a Button. This allows users to create their own graphics and implement them within the software project. The Bitmap Button object can be used to activate or deactivate components assigned to a Discrete Tag Name. The C-more Micro-Graphic display only supports two colors, black and white.	
The **Frame** object allows the uses to insert a Frame to the project that can be used to Frame other objects. Some of the uses for Frame object include but are not limited to graphically separating objects for different operations that may appear on one screen and emphasizing pushbuttons or other objects that may require more attention by the operator.		The **Static Bitmap** offers the ability to display a Bitmap graphic on any screen. The Static Bitmap does not change state. Refer to the Dynamic Bitmap Object if you require the graphic object to change state based on a Tag Value in your PLC. The dialog box for a "Static Bitmap" object allows you to "read from disk" and select a graphic file for import. Graphics must be in one of the following formats: .BMP .WMF .JPG .JPEG	
The **Pushbutton** object is available from the Button Category of the Object List window. The Pushbutton object is an electronic version of a typical Pushbutton normally found on control panels. The Pushbutton object can be used to activate or deactivate components assigned to a Discrete Tag Name.		**Recipe** objects make it easy to make a large number of tag changes with the push of a single button. Create Recipes with up to 99 entries, and multiple sets of values. Then just push a button to load an entire set of values into the group of recipe tags.	
The **Switch** object is an electronic version of a typical Switch that normally can be found on control panels. The Switch object can be used to activate or deactivate components assigned to a Discrete Tag Name.		The **Dynamic Bitmap** object offers the ability to make an object using two different Bitmap graphics that will display one graphic when the Tag is On and a different graphic when the Tag is Off. Use your own bitmap designs or use some of the bitmaps provided with the software that are located in the User Graphic Library.	
The **Indicator Button** object is available from the Button Category of the Object List window. The Indicator Button object is an electronic version of a typical Indicator Button normally found on control panels. The Indicator Button is a combination of a Pushbutton and an Indicator Light. The Indicator Button can be used to activate or deactivate components assigned to a Discrete Tag Name.		The **Static Text** object is used to display a Frame with a personalized Message. This Frame and Message can be placed on any screen and any location within the screen.	
The **Indicator Light** object is an electronic version of a typical Indicator Light normally found on industrial control panels. The Indicator Light can be configured to display the status of the assigned Discrete Tag Name.		The **Lookup Text** object is used to display a Frame with a personalized Message. This Frame and Message can be placed on any screen and any location within the screen. The object is always displayed like a sign but is configured to display only the message prompted by an assigned Tag Name. Messages are retrieved from a Message Database which is configured by the user with text defined by the user. The Lookup Text Object will scroll text up to 128 characters.	
The **Graphic Indicator Light** object is a more enhanced version of the "Indicator Light Object" that allows the user to choose more detailed graphics to display the status of a tag. This object is an electronic version of a typical Indicator Light normally found on industrial control panels. The Indicator Light can be configured to display the status of the assigned Discrete Tag Name.		The **Dynamic Text** object is used to display text that is retrieved from data stored in a Tag. The Tag Name is assigned to registers in the PLC that contain set character data. The data can be stored in the PLC in ASCII format and may include information such as machine numbers, locations, part numbers, and such. The Message can be configured to be visible (Trigger) when an associated Tag Name is On or Off. This object can be placed on any screen and any location within the screen. The Dynamic Text Object will scroll text up to 40 characters.	
The **Numeric Display** consists of a frame that displays a real-time numeric value according to the value of data received from an assigned Tag Name. The Numeric Display supports numeric Signed Decimal, Unsigned Decimal, BCD, and Floating Point data types with up to 11 digits, including decimal point. User Defined Alpha Numeric Prefix and Suffix values are also supported.		The **Scroll Text** object is available from the Text Category of the Object List window. The Scroll Text object is an electronic version of a marquee. It is similar to the Static Text Object. If the text in the object does not fit in the window, it will scroll from right to left across the window. The Scroll Text object does not require a Tag Name assignment. The Scroll Text Object has a maximum character limit of 128 characters.	
The **Numeric Entry** object is used to enter a value from your Panel to a PLC Register. This object, when selected, opens a Numeric Keypad that allows the user to enter a new value that will be written to the assigned Tag Name. The Numeric Entry supports numeric Signed Decimal, Unsigned Decimal, BCD, and Floating Point data types with up to 11 digits, including decimal points. User Defined Alpha Numeric Prefix and Suffix values are also supported.		The **Screen Change** Pushbutton object is available from the Control Category of the Object List window. The Screen Change Pushbutton object is a pushbutton that can be configured to activate another screen in the project. This object may be edited to various colors and sizes. Users can configure the button to activate the Power-Up screen, Forward Screen, Previous Screen, or any one of the project screens.	
The **Increment/Decrement Value** object is used to add or subtract a value by pressing a button on the Panel. Basically the object uses two Tags, one to read a value from and another to write a modified value to. The Increment/Decrement Value supports numeric Signed Decimal, Unsigned Decimal, BCD, and Floating Point data types with up to 11 digits, including decimal points. The Increment and decrement values are also user selectable.		The **Screen Selector** object is available from the Control Category of the Object List window. This object is an enhanced version of the Screen Change pushbutton in that it offers many more features and defaults with data from screens in the project. This helps to save time by not having to create Screen change buttons for each screen. This object may be edited to various colors and sizes.	
The **Real Time Graph** object displays the value stored in up to two PLC tags, over a history of up to 24 points each. One point is added at each refresh.		The **Adjust Display Contrast** object is used to allow the operator to adjust the Panel Display Contrast. The default Display setting often works in most applications, however lighting may vary based on the location of each application. In these cases the operator can use this object to make adjustments. The current display setting value will appear on the top of the button and will change as the arrow keys are pressed. This button can be modified to various sizes.	
The **Line Graph** object displays the values of up to 24 PLC address points. Up to two address arrays can be displayed. The line is drawn in its entirety at each refresh.		The **Function** object is used to assign the panels function key buttons to a particular action as well as assigning the control of the LED On/Off status. When a button has been assigned as a shift button, the then F1 through F5 will become F6 through F10. The Function Object buttons will activate when the hardware button is pressed or when the object is pressed on the screen. The object size is restricted so that the keys will line up with the hardware function keys on the panel.	

C-more Micro-Graphic Programming Connections

C-more STN Micro-Graphic Programming Connection

Using the **C-more** Micro-Graphic Programming Software for project development, STN **C-more** Micro-Graphic panels can be connected to a PC (personal computer) by using EA-MG-PGM-CBL, the USB-to-RS-232 cable assembly.

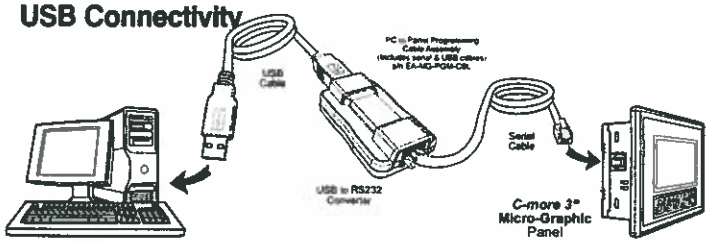
- Connect the USB programming cable (included) from a USB port type A on the PC to the USB type B port on the converter (included). Next connect the serial programming cable from the converter's RJ12 port to the panel's RJ12 serial port. The panel receives power from the USB port of the PC that it is connected to through the USB to RS-232 converter assembly.

USB to RS-232 Programming Cable Assembly

Part No. EA-MG-PGM-CBL

<--->

USB Connectivity



NOTE: The TFT panels EA1-T4CL and EA1-T6CL do NOT use the EA-MG-PGM-CBL assembly. The TFT panels use a standard USB A-to-B type cable such as USB-CBL-AB6. See below.

USB to RS-232 Converter Specifications	
Part Number	EA-MG-PGM-CBL
Hardware	
USB Interface	USB Specification Rev. 1.1 Connector: USB Type B jack to accept USB Type B cable plug
Serial Interface	RS-232 (EIA-232-E) Connector: RJ12 phone jack 6p to accept RJ12 cable plug
Baud Rate	115.2 kbps Maximum
Input Voltage	5 VDC (Supplied thru serial interface cable.)
Power Consumption	50 mA (Does not include power to panel and/or bezel.)
Accessory Cables (included)	
USB Cable	USB Type A plug to PC on one end, USB Type B plug to converter on other end, 0.30 m (1 foot] length (* Note)
Serial Cable	RJ12 phone plug connectors on both ends, 2.0 m (6.56 feet] length (* Note)
Physical	
Dimensions	2.559" (W) x 1.417" (H) x 0.886" (D) (65.0 mm x 36.0 mm x 22.5 mm)
Weight	1.06 oz. (30 g]
Environmental	See Micro-Graphic panel specifications at the beginning of this catalog section.
*** Note: Maximum cable length for either the USB or serial cable should not exceed 2.0 m [6.56 feet] in length.**	

C-more TFT Micro-Graphic Programming Connection

The **C-more** TFT Micro-Graphic panels EA1-T4CL and EA1-T6CL include an integral USB to serial converter. It is programmed via any USB Type A to Type B cable.

When properly installed on your PC, the device driver will be assigned a communication port number and appear in Windows Device Manager as a serial com port.

USB cable options for programming EA1-T4CL and EA1-T6CL

Part Number	Description	Price
USB-CBL-AB3	Standard 3-ft. (0.9 m) USB 2.0 cable, A-type connector to B-type connector, used to connect personal computer to any **C-more** touch panel for setup and programming. (Note: Touch panels require a 24 VDC power source for configuration and operation.)	<--->
USB-CBL-AB6	Standard 6-ft. (1.8 m) USB 2.0 cable, A-type connector to B-type connector, used to connect personal computer to any **C-more** touch panel for setup and programming. (Note: Touch panels require a 24 VDC power source for configuration and operation.)	<--->
USB-CBL-AB10	Standard 10-ft (3 meter) USB 2.0 cable, A-type connector to B-type connector, used to connect personal computer to any **C-more** touch panel for setup and programming. (Note: Touch panels require a 24 VDC power source for configuration and operation.)	<--->
USB-CBL-AB15	Standard 15-ft. (4.6 m) USB 2.0 cable, A-type connector to B-type connector, used to connect personal computer to any **C-more** touch panel for setup and programming. (Note: Touch panels require a 24 VDC power source for configuration and operation.)	<--->

DirectView 1000

4-line by 16-character backlit LCD display

DV-1000 <--->

Overview

The *Direct*View DV-1000 is a small, low-cost operator interface. The DV-1000 can be directly connected to DL05, DL06, DL105, DL205, D3-350 or DL405 CPUs. The DV-1000 is a "ladder logic dependent" terminal which relies entirely on PLC ladder logic to perform its functions. The DV-1000 does not require any configuration software. Instead, setup is performed through special reserved memory locations inside of the CPU. These special memory areas tell the DV-1000 which modes to use, and more importantly, where to get its display data. The following functions can be performed by the DV-1000:

View memory status: Display up to four variable address values at a time on a single screen.

View bit status: Display 32 bits (4 lines of 8 bits) or 64 bits (4 lines of 16 bits) at a time on a single screen. Bit data types can include I/O points, control relays, timer/counter and stage bits.

Change values of memory locations: Up to 16 different variable memory values can be changed (32 for DL405). Just move the cursor over the appropriate digit and press the increment (+)/decrement (-) keys.

Units per CPU: Only one DV-1000 per CPU.

Specifications	
Cable Required	DV-1000CBL or D4-1000CBL. See the following page
Max. Distance	15 feet from the CPU
Connector	Phone jack RJ12
Power Consumption	150mA @ 5VDC max (supplied by PLC communication port)
NEMA Rating	None
Agency Approval	UL, CUL, CE
Storage Temp	-4 to 158°F (-20 to 70°C)
Operating Temp	32 to 122°F (0 to 50°C)
Humidity	5-95% (non-condensing)
Vibration Resistance	MIL STD 810C Method 514.2
Shock Resistance	MIL STD 810C Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases
Manufacturer	Koyo Electronics

Part Number	Price	Description
DV-1000	<--->	*Direct*View 1000 Timer/Counter access unit for *Direct*LOGIC PLCs
DV-1000CBL	<--->	Shielded cable to connect to *Direct*LOGIC PLCs, (RS-232C)
D4-1000CBL	<--->	Shielded cable to connect to 15-pin port on DL405 PLCs (RS232C)

Display user-defined messages, even with embedded V-memory values: Each line may contain a maximum of four embedded values. Messages are stored in CPU variable memory. Therefore, the number of messages is limited only by available CPU variable memory.

Display system-defined error messages and user-defined fault messages even in list format: Scroll through errors and messages. Error logs can even show time and date stamps on DL06 family, D2-240, D2-250-1, D2-260, D3-350, D4-440, D4-450 CPUs.

Is the DV-1000 right for you?

The DV-1000 is best suited for displaying information and occasionally changing setpoint parameters. To use the DV-1000 you should be very comfortable with ladder logic programming. If you're looking for an operator control panel, you should consider the ***C-more*** family of panels. They are better suited for applications that require operator interaction as a normal part of operation.

Which CPU is best to use with the DV-1000?

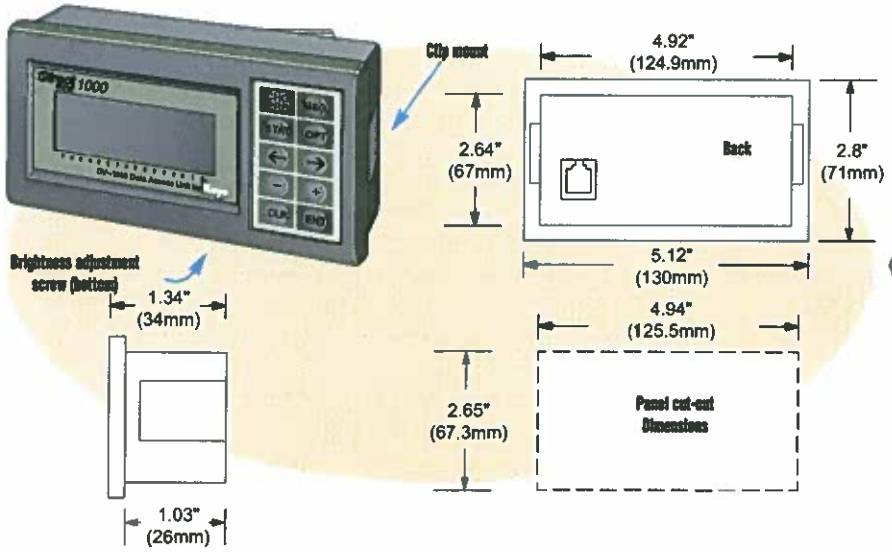
The DL05, DL105, DL06, D2-240, D2-250-1, D2-260, D3-350, D4-440, and D4-450 have ACON instructions that make the DV-1000 easier to work with. The DL105 and D2-230 have only one communication port, which can be a limitation in some cases. The DV-1000 does not work with D3-330 or D3-340 CPUs, CLICK controllers or Productivity3000 CPUs.

DV-1000 Dimensions and Installation

Installation

The DV-1000 is designed to snap into a rectangular cutout in a control panel or other surface panel. On each side of the housing there is a retention clip to keep the unit in place after installation. There are no provisions for mounting screws, so if your particular application is subject to high amounts of vibration, this may be a factor in your selection process. The drawing gives the physical dimensions of the DV-1000 housing.

The panel cut-out dimensions provide necessary clearance for the body of the unit and allow the outer housing bezel to cover the edges of the cut-out for a nice finished appearance. The optimum panel thickness for using the retention clips is 1/16" to 1/8".



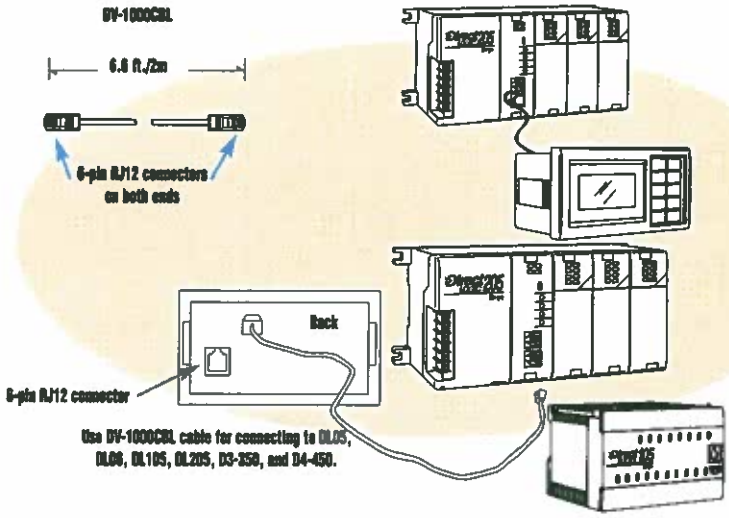
Cabling requirements

Since the DV-1000 only works with the DL05, DL06, DL105, DL205, D3-350 and DL405 CPUs, your cabling choices are fairly simple.

- **DV-1000CBL** — connects to DL05, DL06, DL105, DL205, D3-350 and D4-450 phone jack.
- **D4-1000CBL** — connects to all DL405 CPU 15-pin ports.

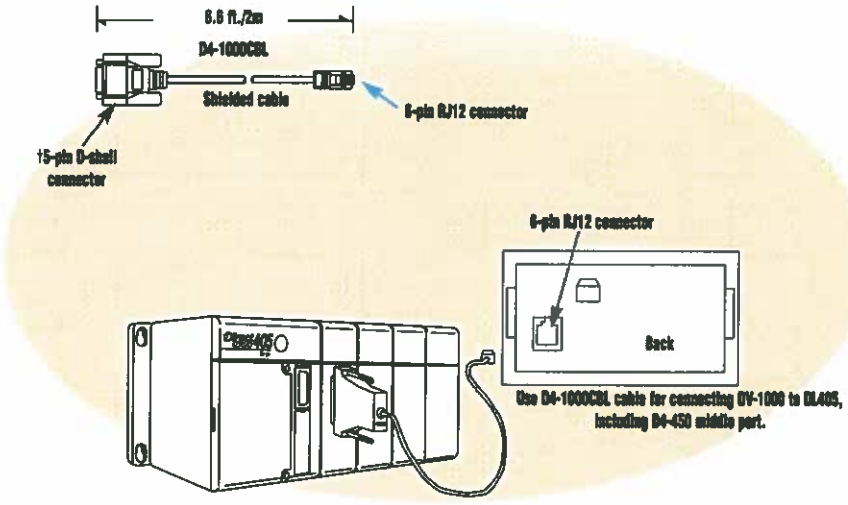
Maximum cable length of 15 feet between the DV-1000 and the PLC is recommended.

The DV-1000 can be connected to a DL205 or DL405 DCM, but you have to build your own cable.



C-more Micro-Graphic

The *C-more* Micro-Graphic Panels are a more enhanced small, low-cost graphic operator interface that you may want to consider when selecting a panel. The *C-more* Micro-Graphic panels are available in both a touch screen and non-touch version. The C-more panels will work with all *Direct*LOGIC PLCs and will also work with many different 3rd party PLCs.



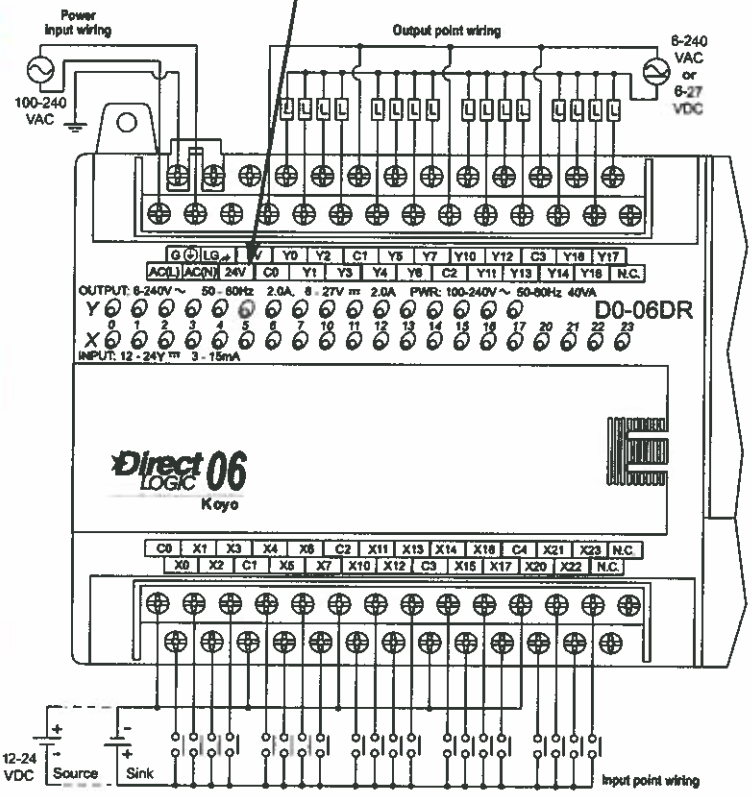
DL06 I/O Specifications

D0-06DR <--->

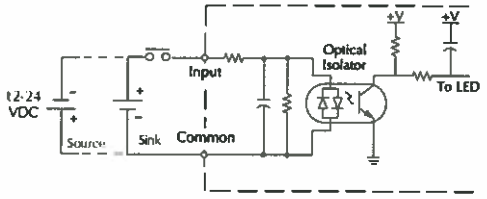
Wiring diagram and specifications

D0-06DR Specifications			
AC Power Supply Specifications	Voltage Range	100-240VAC (40VA)	
DC Input Specifications	Number of Input Pts.	20 (sink/source)	
	Number of Commons	5 (isolated)	
	Input Voltage Range	12-24VDC	
	Input Impedance	(X0-X3) 1.8K @ 12-24VDC (X4-X23) 2.8K @ 12-24VDC	
	On Current/ Voltage Level	>5mA/10VDC	
	OFF Current/ Voltage Level	<0.5mA/<2VDC	
	Response Time	X0-X3	X4-X23
	OFF to ON Response	<100µs	<8ms
	ON to OFF Response	<100µs	<8ms
	Fuses	None	
Relay Output Specifications	Number of Output Points	16	
	Number of Commons	4 (isolated)	
	Output Voltage Range	6-240VAC, 47-63Hz 6-27VDC	
	Maximum Voltage	264VAC,30VDC	
	Maximum Current	2A/point 6A/common	
	Maximum Leakage Current	0.1mA @ 246VAC	
	Smallest Recommended Load	5mA @ 5VDC	
	OFF to ON Response	<15ms	
	ON to OFF Response	<10ms	
	Status Indicators	Logic side	
	Fuses	None (external recommended)	

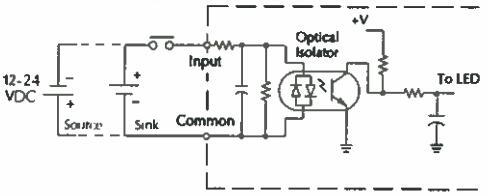
Note: Refer to Power Budgeting for Auxiliary 24VDC current available.



Equivalent input circuit, Standard inputs (X4-X23)

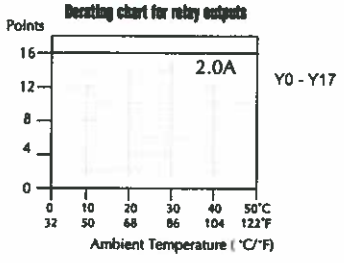


Equivalent input circuit, High-speed inputs (X0-X3)

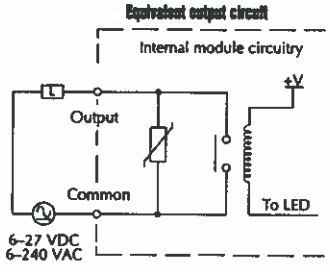


Typical Relay Life (Operations) at Room Temperature		
Voltage and Type of Load	Load Current	
	At 1A	At 2A
24 VDC Resistive	500K	250K
24 VDC Inductive	100K	50K
110 VAC Resistive	500K	250K
110 VAC Inductive	200K	100K
220 VAC Resistive	350K	200K
220 VAC Inductive	100K	50K

Derating chart for relay outputs



Equivalent output circuit



Features at a Glance

The DL05 and DL06 micro PLCs are complete self-contained systems. The CPU, power supply, and I/O are all included inside the same housing. Option modules are available to expand the capability of each PLC family for more demanding applications. The standard features of these PLCs are extraordinary and compare favorably with larger and more expensive PLCs.

The specification tables to the right are meant for quick reference only. Detailed specifications and wiring information for each model of the DL05 and DL06 PLCs begin on page 2-33.

Program capacity

Most boolean ladder instructions require a single word of program memory. Other instructions, such as timers, counters, etc., require two or more words. Data is stored in V-memory in 16-bit registers.

Performance

The performance characteristics shown in the tables represent the amount of time required to read the inputs, solve the Relay Ladder Logic program and update the outputs.

Instructions

A complete list of instructions is available at the end of this section.

Communications

The DL05 and DL06 offer powerful communication features normally found only on more expensive PLCs.

Special features

The DC input and DC output PLCs offer high-speed counting or pulse output. Option module slots allow for discrete I/O expansion, analog I/O, or additional communication options.

DL05 CPU Specifications

System capacity	
Total memory available (words)	6K
Ladder memory (words)	2,048
V-memory (words)	4,096
User V-memory	3,968
Non-volatile user V-memory	128
Battery backup	Yes[1]
Total built-in I/O	14
Inputs	8
Outputs	6
I/O expansion	Yes[1]
Performance	
Contact execution (Boolean)	0.7µs
Typical scan (1K Boolean)[2]	1.5-3ms
Instructions and diagnostics	
RLL ladder style	Yes
RLLPLUS/flowchart style (Stages)	Yes/256
Run-time editing	Yes
Supports Overrides	Yes
Scan	Variable/fixed
Number of Instructions	133
Types of Instructions:	
Control relays	512
Timers	128
Counters	128
Immediate I/O	Yes
Subroutines	Yes
For/next loops	Yes
Timed interrupt	Yes
Integer math	Yes
Floating-point math	No
PID	Yes
Drum sequencers	Yes
Bit of word	Yes
ASCII print	Yes
Real-time clock/calendar	Yes[1]
Internal diagnostics	Yes
Password security	Yes
System and user error log	No
Communications	
Built-in ports	Two RS-232C
Protocols supported:	
K-sequence (proprietary protocol)	Yes
DirectNet master/slave	Yes
Modbus RTU master/slave	Yes
ASCII out	Yes
Baud rate	
Port 1	9,600 baud (fixed)
Port 2	selectable 300-38,400 baud (default 9,600)
Specialty Features	
Filtered inputs	Yes[3]
Interrupt input	Yes[3]
High speed counter	Yes, 5kHz[3]
Pulse output	Yes, 7kHz[3]
Pulse catch input	Yes[3]

1- These features are available with use of certain option modules. Option module specifications are located later in this section.

2- Our 1K program includes contacts, coils, and scan overhead. If you compare our products to others, make sure you include their scan overhead.

3- Input features only available on units with DC inputs and output features only available on units with DC outputs.

DL06 CPU Specifications

System capacity	
Total memory available (words)	14.8K
Ladder memory (words)	7680
V-memory (words)	7616
User V-memory	7488
Non-volatile user V-memory	128
Built-in battery backup (D2-BAT-1)	Yes
Total I/O	36
Inputs	20
Outputs	16
I/O expansion	Yes1
Performance	
Contact execution (Boolean)	0.6µs
Typical scan (1K Boolean)2	1-2ms
Instructions and diagnostics	
RLL ladder style	Yes
RLLPLUS/flowchart style (Stages)	Yes/1024
Run-time editing	Yes
Supports Overrides	Yes
Scan	Variable/fixed
Number of Instructions	229
Types of Instructions:	
Control relays	1024
Timers	256
Counters	128
Immediate I/O	Yes
Subroutines	Yes
For/next loops	Yes
Table functions	Yes
Timed interrupt	Yes
Integer math	Yes
Trigonometric functions	Yes
Floating-point math	Yes
PID	Yes
Drum sequencers	Yes
Bit of word	Yes
Number type conversion	Yes
ASCII in, out, print	Yes
LCD instruction	Yes
Real-time clock/calendar	Yes
Internal diagnostics	Yes
Password security	Yes
System and user error log	No
Communications	
Built-in ports:	One RS-232C
	One multi-function RS232C/RS422/RS485
NOTE: RS485 is for MODBUS RTU only.	
Protocols supported:	
K-sequence (proprietary protocol)	Yes
DirectNet master/slave	Yes
Modbus RTU master/slave	Yes
ASCII in/out	Yes
Baud rate	
Port 1	9,600 baud (fixed)
Port 2	selectable 300-38,400 baud (default 9,600)
Specialty Features	
Filtered inputs	Yes[3]
Interrupt input	Yes[3]
High speed counter	Yes, 7kHz[3]
Pulse output	Yes, 10kHz[3]
Pulse catch input	Yes[3]

1- These features are available with use of certain option module. Option module specifications are located later in this section.

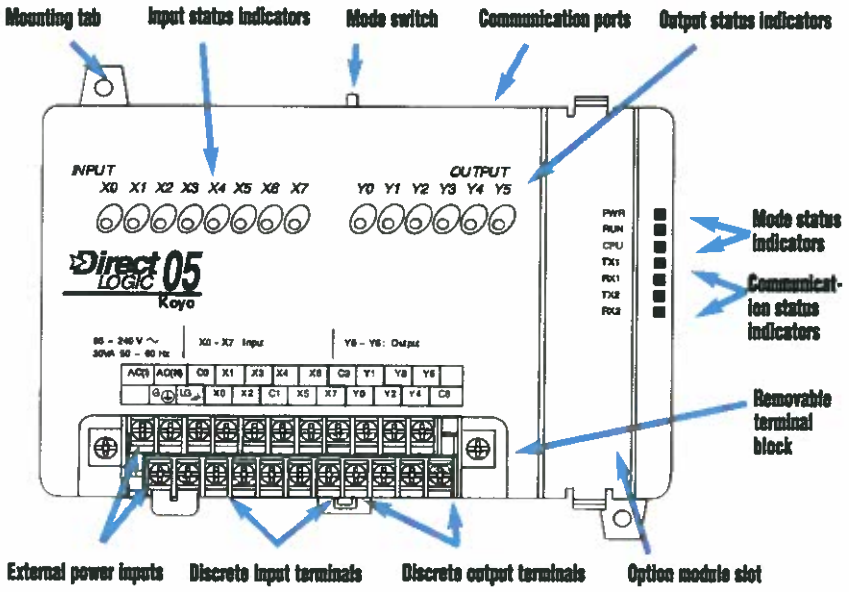
2- Our 1K program includes contacts, coils, and scan overhead. If you compare our products to others, make sure you include their scan overhead.

3- Input features only available on units with DC inputs and output features only available on units with DC outputs.

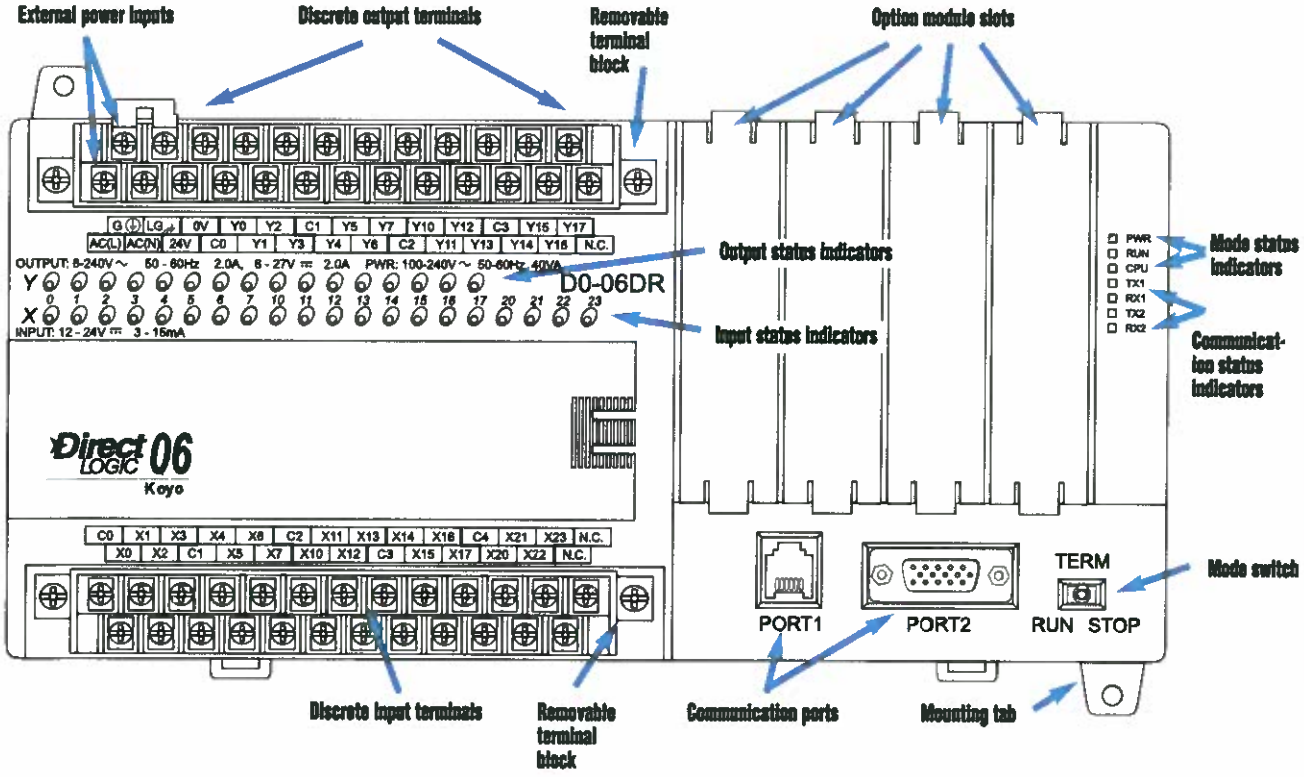
Features at a Glance

*Direct*SOFT software

The DL05 and DL06 PLCs use the same familiar *Direct*SOFT programming software that our larger PLCs use. A FREE version of *Direct*SOFT gives you all the great features of the full version, but with a 100-word PLC program download limitation. For programs larger than 100 words, the full package is required. The FREE PC-DS100 software may be sufficient to program the DL05 and DL06. If you are programming with a full package version prior to v5.0, you will need v2.4 or later for the DL05 PLCs and v4.0 or later for the DL06. We always recommend the latest version for the most robust features. See the Software section in this catalog for a complete description of *Direct*SOFT including features, part numbers of programming packages and upgrades.



Hardware features diagrams

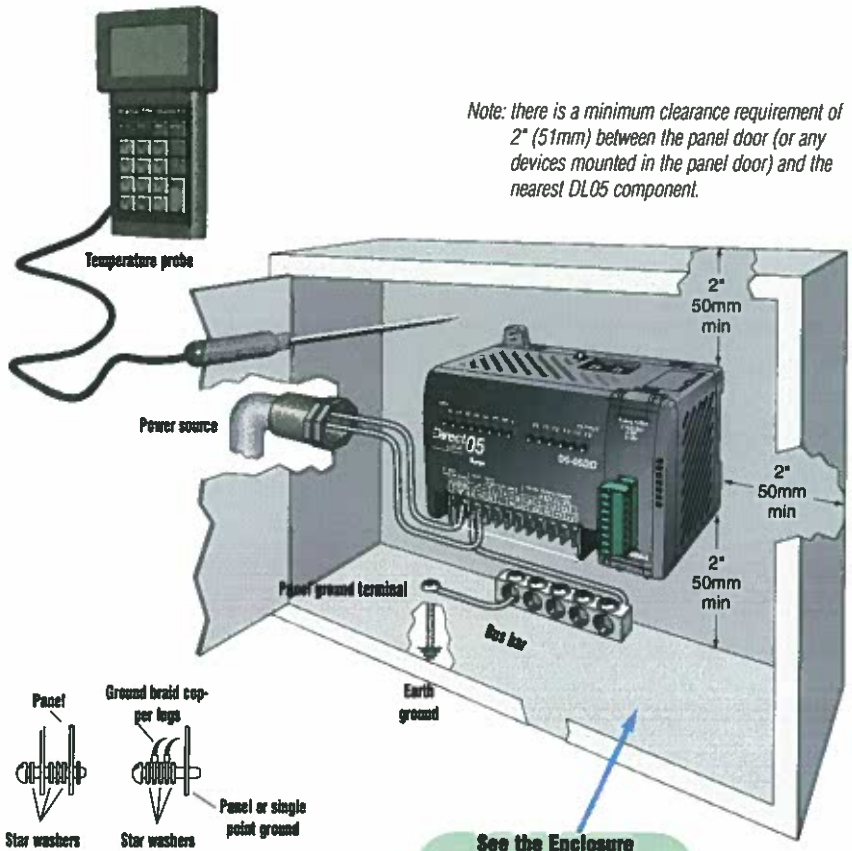


Product Dimensions and Installation

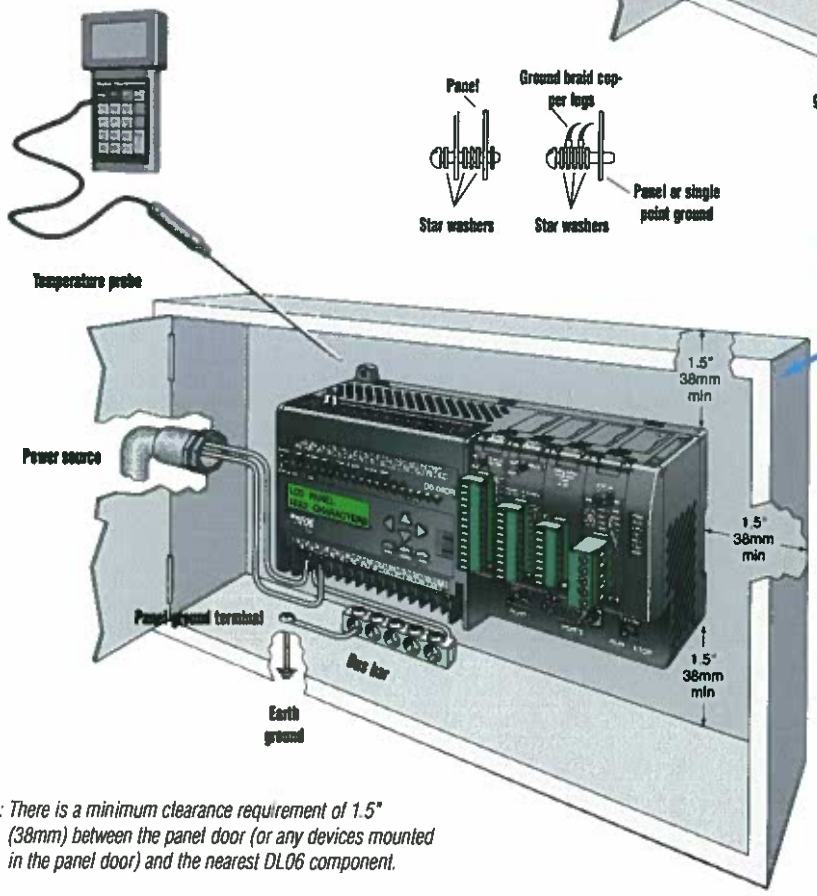
It is important to understand the installation requirements for your DL05 or DL06 system. Your knowledge of these requirements will help ensure that your system operates within its environmental and electrical limits.

Plan for safety

This catalog should never be used as a replacement for the user manual. You can purchase, download free, or view online the user manuals for these products. The D0-USER-M is the publication for the DL05 PLCs, and the D0-06USER-M is the publication for the DL06 PLCs. The D0-OPTIONS-M is the user manual for the option modules. These user manuals contain important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.



Note: there is a minimum clearance requirement of 2" (51mm) between the panel door (or any devices mounted in the panel door) and the nearest DL05 component.



Note: There is a minimum clearance requirement of 1.5" (38mm) between the panel door (or any devices mounted in the panel door) and the nearest DL06 component.

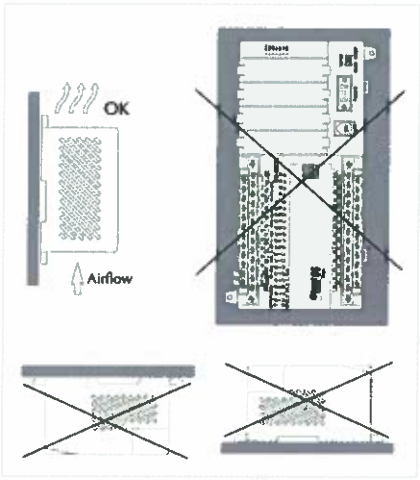
See the Enclosure section to find an enclosure that fits your application

Environmental Specifications for DL05 and DL06	
Storage Temperature	-4° F-158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F-131°F (0° to 55°C)
Ambient Humidity	5 to 95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C Method 514.2
Shock Resistance	MIL STD 810C Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

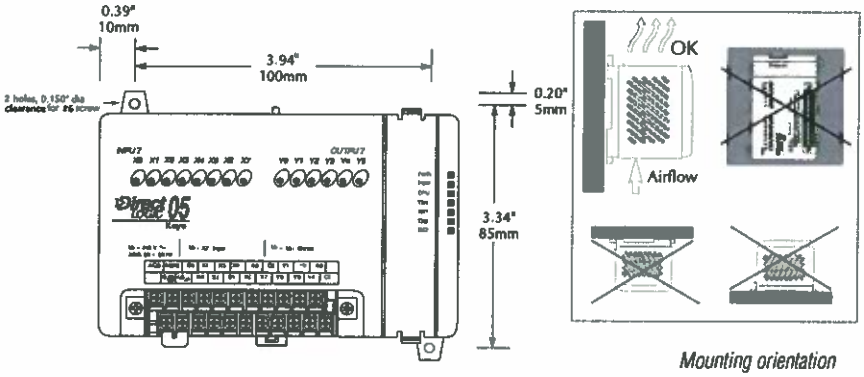
Product Dimensions and Installation

Unit dimensions and mounting orientation

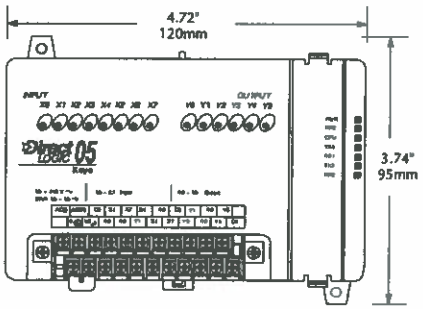
DL05 and DL06 PLCs must be mounted properly to ensure ample airflow for cooling purposes. It is important to follow the unit orientation requirements and to verify that the PLC's dimensions are compatible with your application. Notice particularly the grounding requirements and the recommended cabinet clearances.

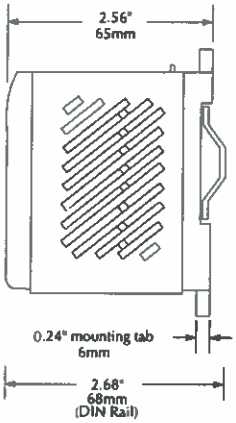


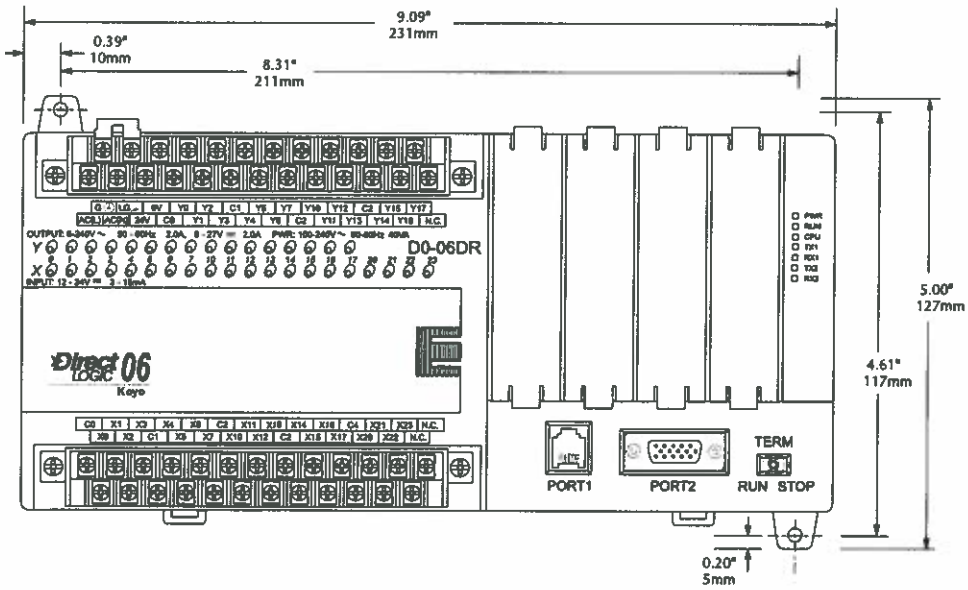
Mounting orientation

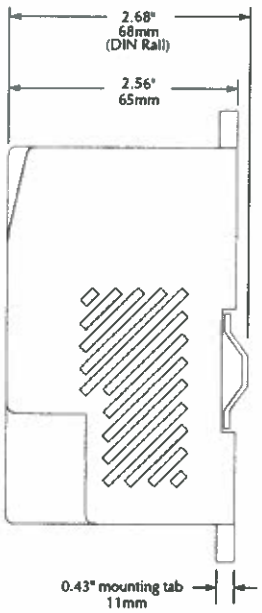


Mounting orientation









Choosing the I/O Type

DL06 Base Unit I/O Table							
Part Number	Inputs			Outputs			Price
	I/O Type/ Commons	Sink or source	Voltage Ranges	I/O Type/ Commons	Sink or Source	Voltage/Current Ratings	
D0-06AA	AC/5	N/A	90-120VAC	AC/4	N/A	17-240VAC, 0.5A 50/60 Hz	<--->
D0-06AR	AC/5	N/A	90-120VAC	Relay/4	N/A	6-27VDC, 2A 6-240VAC, 2A	<--->
D0-06DA	DC/5	Sink or source	12-24VDC	AC/4	N/A	17-240VAC, 0.5A 50/60Hz	<--->
D0-06DD1	DC/5	Sink or source	12-24VDC	DC/4	Sink	6-27VDC, 0.5A (Y0-Y1) 6-27VDC, 1.0A (Y2-Y17)*	<--->
D0-06DD2	DC/5	Sink or source	12-24VDC	DC/4	Source	12-24VDC, 0.5A (Y0-Y1) 12-24VDC, 1.0A (Y2-Y17)	<--->
D0-06DR	DC/5	Sink or source	12-24VDC	Relay/4	N/A	6-27VDC, 2A 6-240VAC, 2A	<--->
D0-06DD1-D	DC/5	Sink or source	12-24VDC	DC/4	Sink	6-27VDC, 0.5A (Y0-Y1) 6-27VDC, 1.0A (Y2-Y17)*	<--->
D0-06DD2-D	DC/5	Sink or source	12-24VDC	DC/4	Source	12-24VDC, 0.5A (Y0-Y1) 12-24VDC, 1.0A (Y2-Y17)	<--->
D0-06DR-D	DC/5	Sink or source	12-24VDC	Relay/4	N/A	6-27VDC, 2A 6-240VAC, 2A	<--->

*** These outputs must be derated to 0.6A for EN61131-2 compliance.**

Discrete I/O Option Moduless							
Part Number	Inputs			Outputs			Price
	I/O Type/ Number/ Commons	Sink or source	Voltage Ranges	I/O Type/ Number/ Commons	Sink or Source	Voltage/Current Ratings	
D0-07CDR	DC/4/1	Sink or source	12-24VDC	Relay/3/1	N/A	6-27VDC, 1A 6-240VAC, 1A	<--->
D0-08CDD1	DC/4/2	Sink or source	12-24VDC	DC/4/2	Sink	6-27VDC, 0.3A	<--->
D0-08TR	N/A	N/A	N/A	Relay/8/2	N/A	6-27VDC, 1A 6-240VAC, 1A	<--->
D0-10ND3	DC/10/2	Sink or source	12-24VDC	N/A	N/A	N/A	<--->
D0-10ND3F	DC/10/2	Sink or source	12-24VDC	N/A	N/A	N/A	<--->
D0-10TD1	N/A	N/A	N/A	DC/10/2	Sink	6-27VDC, 0.3A	<--->
D0-10TD2	N/A	N/A	N/A	DC/10/2	Source	12-24VDC, 0.3A	<--->
D0-16ND3	DC/16/4	Sink or source	20-28VDC	N/A	N/A	N/A	<--->
D0-16TD1	N/A	N/A	N/A	DC/16/2	Sink	6-27VDC, 0.1A	<--->
D0-16TD2	N/A	N/A	N/A	DC/16/2	Source	12-24VDC, 0.1A	<--->
F0-04TRS	N/A	N/A	N/A	Relay/4/4	N/A	5-30VDC, 3A 5-125VAC, 3A	<--->
F0-08NA-1	AC/8/2	N/A	80-132VAC 90-150VDC	N/A	N/A	N/A	<--->
F0-08SIM	8-pt. Input simulator						<--->

Communications and Specialty Option Modules		
Part Number	Description	Price
H0-ECOM	Ethernet Communications Module 10 Mbit	<--->
H0-ECOM100	Ethernet Communications Module 10/100 Mbit	<--->
D0-DEVNETS	DeviceNET Slave Module	<--->
H0-CTRIO	High Speed Counter I/O Module	<--->
H0-PSCM	Profibus Slave Communications Module	<--->
D0-DCM	Serial Communications Module	<--->
F0-CP128	ASCII CoProcessor Module	<--->

Analog I/O

By using option modules, you can add analog inputs or outputs to your DL05 or DL06 PLC. The table below shows the input and output types at a glance. Detailed specifications are provided later in this section.

Analog I/O Option Modules					
Part Number	Inputs		Outputs		Price
	No.	Input Type	No.	Output Type	
F0-04AD-1	4	0-20mA or 4-20mA	0	N/A	<--->
F0-04AD-2	4	0-5VDC or 0-10VDC	0	N/A	<--->
F0-08ADH-1	8	0-20mA	0	N/A	<--->
F0-08ADH-2	8	0-5VDC or 0-10VDC	0	N/A	<--->
F0-04DAH-1	0	N/A	4	4-20mA	<--->
F0-08DAH-1	0	N/A	8	4-20mA	<--->
F0-04DAH-2	0	N/A	4	0-10VDC	<--->
F0-08DAH-2	0	N/A	8	0-10VDC	<--->
F0-4AD2DA-1	4	0-20mA or 4-20mA	2	0-20mA or 4-20mA	<--->
F0-2AD2DA-2	2	0-5VDC or 0-10VDC	2	0-5VDC or 0-10VDC	<--->
F0-4AD2DA-2	4	0-5VDC or 0-10VDC	2	0-5VDC or 0-10VDC	<--->
F0-04RTD	4	RTD	0	N/A	<--->
F0-04THM*	4	Thermo-couple / Voltage	0	N/A	<--->

*** See module specifications page for thermocouple types and voltage input ranges supported**

Power budgeting

No power budgeting is necessary for the DL05. The built-in power supply is sufficient for powering the base unit, any of the option modules, the hand-held programmer, and even a DV1000 operator interface.

Power budgeting is necessary for the DL06. With four option module slots and an optional LCD display, it is necessary to verify that sufficient power is available for all optional devices. Power budgeting is described in detail on page 2-29 and in the DL06 User Manual.

Networking the DL05 and DL06

All DL05 and DL06 PLCs have built-in networking capability. The DL05 family offers two 6-pin, RS-232 ports. You can use these ports for programming, networking, or connecting an operator interface device. The RS-232 ports support point-to-point communications using the optional D0-CBL cable. If you need to create a multi-drop network or require longer distances between devices, you can use the FA-ISOCON at each DL05 to convert the RS-232 signal to RS-422 or RS-485.

The DL06 family of PLCs offers even greater communications flexibility. Port 1 is a fixed baud rate port identical to port 1 on the DL05 PLCs, but port 2 is a multi-function port that can be used as RS-232, RS-422, or RS-485 (Modbus/ASCII only) without using external converters. This allows you to create multi-drop networks with minimal installation headaches.

Protocols supported

Each port is capable of communicating using K-sequence, *Direct*NET and Modbus RTU protocols. Port 1 can only be a slave for each of the protocols. Port 2 can serve as a K-sequence slave or a network master or slave for either *Direct*NET or Modbus RTU protocols.

Serial Bus Protocols

We also offer option modules that allow you to connect a DL05 or DL06 PLC to a variety of network as a slave device. Our D0-DEVNETS (DeviceNet) and H0-PSCM (PROFIBUS) option modules plug into any DL05 or DL06 PLC. The D0-DCM Data Communications module supports *Direct*NET and Modbus RTU protocols.

ZIPLink communication adapter modules

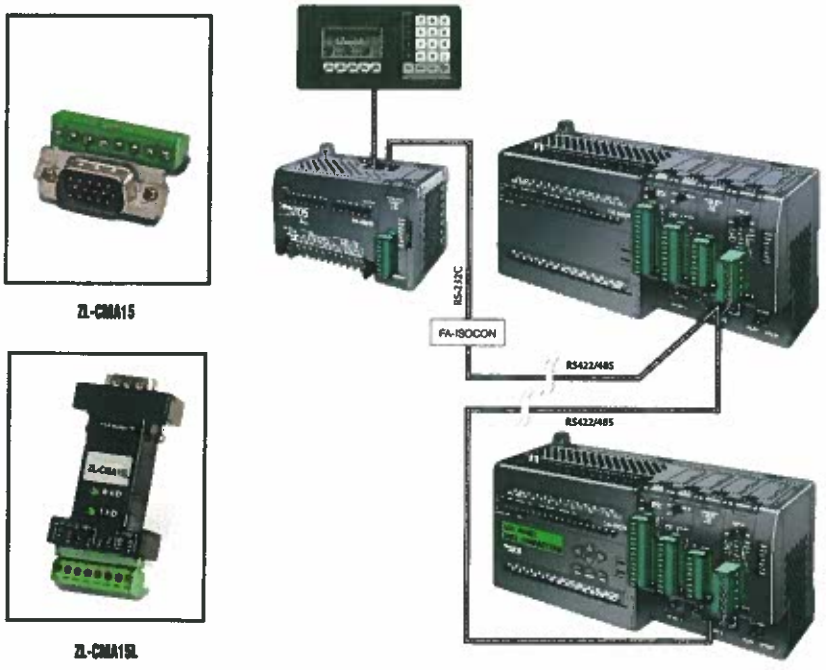
The ZIPLink communications adapter modules offer fast and convenient screw terminal connection for the bottom port of the DL06 CPU. The adapter modules are RS232/422 DIP switch selectable and are offered with or without indicating LEDs and surge protection. See the Wiring Solutions section in this catalog for more information.

Optional Ethernet communication modules

Need to connect to a high speed HMI or computer system? We offer 10Base-T and 100Base-T Ethernet communications modules. You can use the H0-ECOM and H0-ECOM100 Ethernet communication modules with our Stride Ethernet switches or with most off-the-shelf Ethernet hubs or switches. The ECOM option modules plug into any DL05 or DL06 PLC. The H0-ECOM100 supports the industry standard Modbus TCP protocol.

Point-to-point

Multi-drop



Z1-CMA15

Z1-CMA15L

Ports, Status Indicators, and Modes

Port 1

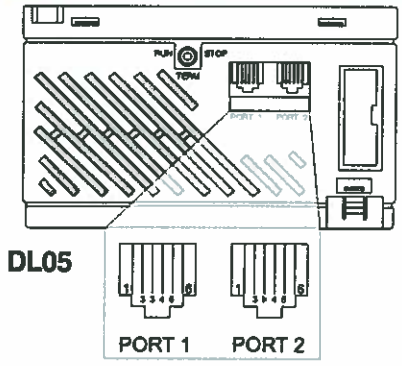
Port 1 is a 6-pin, fixed configuration port and has the same pin assignments on the DL05 and the DL06. Please refer to the table and diagrams on this page. This port can be used to connect to an HPP, *Direct*SOFT, an operator interface, or other external device. Features include:

- 9600 baud
- 8 data bits
- Odd parity
- 1 start bit, 1 stop bit
- Station address of 1
- Asynchronous, half-duplex, DTE

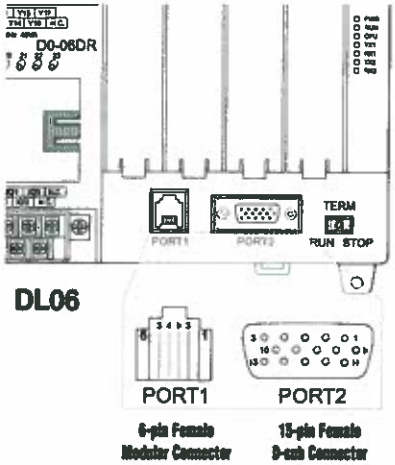
Protocols supported (as slave):

- K sequence, *Direct*NET, Modbus RTU

DL05 & DL06 Port 1 Pin Descriptions		
1	0V	Power (-) connection (GND)
2	5V	Power (+) connection
3	RXD	Receive data (RS-232C)
4	TXD	Transmit data (RS-232C)
5	5V	Power (+) connection
6	0V	Power (-) connection (GND)



6-pin Female Modular Connector



6-pin Female Modular Connector | 15-pin Female D-sub Connector

Port 2

Port 2 is a configurable port on both the DL05 and the DL06 PLCs. The DL05 PLC uses a 6-pin modular connector and offers RS-232 communications only. The DL06 PLC uses a 15-pin HD-sub connector and offers RS-232, RS-422, or RS-485 communications. Please refer to the table and diagrams on this page for more information. This port can be used to connect to an HPP, *Direct*SOFT, an operator interface, or other external device. Features of port 2 include:

- 300, 600, 1200, 2400, 4800, 9600 (default), 19,200, 38,400 baud
- 8 data bits
- Odd (default), even, or no parity
- 1 start bit, 1 stop bit
- Station address:
  - 1 (default)
  - 1-90 DirectNET, K sequence
  - 1-247 Modbus RTU
- Asynchronous, half-duplex, DTE

Protocols supported:

- K sequence (slave), *Direct*NET (master/slave), Modbus (master/slave)

DL05 Port 2 Pin Descriptions		
1	0V	Power (-) connection (GND)
2	5V	Power (+) connection
3	RXD	Receive data (RS-232C)
4	TXD	Transmit data (RS-232C)
5	RTS	Ready to send
6	0V	Power (-) connection (GND)

DL06 Port 2 Pin Descriptions		
1	5V	Power (+) connection
2	TXD	Transmit data (RS-232C)
3	RXD	Receive data (RS-232C)
4	RTS	Ready to send (RS232C)
5	CTS	Clear to send (RS232C)
6	RXD-	Receive data (-) (RS-422/485)
7	0V	Power (-) connection (GND)
8	0V	Power (-) connection (GND)
9	TXD+	Transmit data (+) (RS-422/485
10	TXD-	Transmit data (-) (RS-422/485)
11	RTS+	Ready to send (+) (RS-422/485)
12	RTS-	Ready to send (-) (RS-422/485)
13	RXD+	Receive data (+) (RS-422/485)
14	CTS+	Clear to send (+) (RS-422/485)
15	CTS-	Clear to send (-) (RS-422/485)

DL05 and DL06 status indicators

Status Indicators		
Indicator	**Status**	**Meaning**
PWR	ON	Power good
	OFF	Power failure
RUN	ON	CPU is in Run Mode
	OFF	CPU is in Stop or Program Mode
CPU	ON	CPU self diagnostics error
	OFF	CPU self diagnostics good
TX1	ON	Data is being transmitted by the CPU-Port 1
	OFF	No data is being transmitted by the CPU-Port 1
RX1	ON	Data is being received by the CPU-Port 1
	OFF	No data is being received by the CPU-Port 1
TX2	ON	Data is being transmitted by the CPU-Port 2
	OFF	No data is being transmitted by the CPU-Port 2
RX2	ON	Data is being received by the CPU-Port 2
	OFF	No data is being received by the CPU-Port 2

DL05 and DL06 mode switches

Mode Switch Position	CPU Action
RUN (Run Program)	CPU is forced into the RUN mode if no errors are encountered. No program changes are allowed by the programming/monitoring device.
TERM (Terminal)	RUN PROGRAM and the TEST modes are available. Mode and program changes are allowed by the programming/monitoring device.
STOP	CPU is forced into the STOP mode. No changes are allowed by the programming/monitoring device.

Use the optional low profile 15-pin adapter to make option module wiring easier.

ASCII and Modbus Instructions

ASCII instructions for DL06

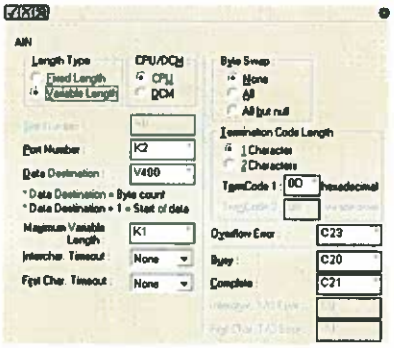
The DL06 PLC supports several easy to use instructions, which allow ASCII strings to be read into or written from the communication ports when using either the CPU port 2, or the D0-DCM Data Communications Module port 2.

Raw ASCII: CPU/DCM Port 2 can be used for either reading or writing raw ASCII strings, but not for both.

Embedded ASCII: With these instructions, you can use the DL06 PLC to locate ASCII strings embedded within a supported protocol via CPU/DCM Port.

Receiving ASCII strings

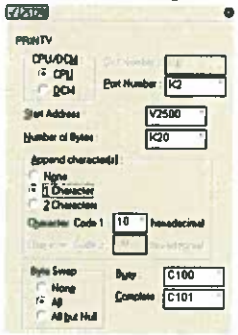
1. ASCII IN (AIN) - This instruction configures CPU/DCM Port 2 for raw ASCII input strings, with parameters such as fixed and variable length ASCII strings, termination characters, byte swapping options, and instruction control bits. Use barcode scanners, weigh scales, etc., to write raw ASCII input strings into CPU/DCM Port 2 based on the AIN instruction's parameters.



2. Write embedded ASCII strings directly to V-memory from an external HMI (or similar master device). The ASCII string is transmitted through CPU/DCM Port 2 using any supported communications protocol. This method uses the familiar RX/WX instructions previously available.
3. If the DL06 is used as a network master, the Network Read instruction (RX) can be used to read embedded ASCII data from a network slave device. Again, the ASCII string would be transmitted through CPU/DCM Port 2, using any supported communications protocol.

Writing ASCII strings

1. Print from V-memory (PRINTV) - Use this instruction to write raw ASCII strings out of CPU/DCM port 2 to a display panel, serial printer, etc. The instruction features the starting V-memory address, string length, byte swapping options, etc. When the instruction's permissive bit is enabled, the string is written to CPU/DCM Port 2.



2. Print to V-memory (VPRINT) - Use this instruction to create pre-coded ASCII strings in the PLC (e.g. alarm messages). When the instruction's permissive bit is enabled, the message is loaded into a pre-defined V-memory address location. Then the PRINTV instruction may be used to write the pre-coded ASCII string out of CPU/DCM Port 2. American, European, and Asian Time/Dates stamps are supported.
3. Print Message (PRINT) - This existing instruction can be used to create pre-coded ASCII strings in the PLC. When the instruction's permissive bit is enabled, the string is written to CPU/DCM Port 2. The VPRINT/PRINTV instruction combination is more powerful and flexible than the PRINT instruction.
4. If the DL06 PLC is a network master, the Network Write (WX) can be used to write embedded ASCII data to an HMI or slave device directly from V-memory. This is done via a supported communications protocol using CPU/DCM Port 2.

More ASCII instructions

ASCII Find (AFIND) - Finds where a specific portion of the ASCII string is located in continuous V-memory addresses.

ASCII Extract (AEX) - Extracts a specific portion (usually some data value) from the ASCII find location or other known ASCII data location.

Compare V-memory (CMPV) - This instruction is used to compare two blocks of V-memory addresses and is usually used to detect a change in an ASCII string. Compared data types must be of the same format (e.g. BCD, ASCII, etc.).

Swap Bytes (SWAPB) - Swaps V-memory bytes on ASCII data that was written directly to V-memory from an external HMI or similar master device via a communications protocol. The AIN and AEX instructions have a built-in byte swap feature.

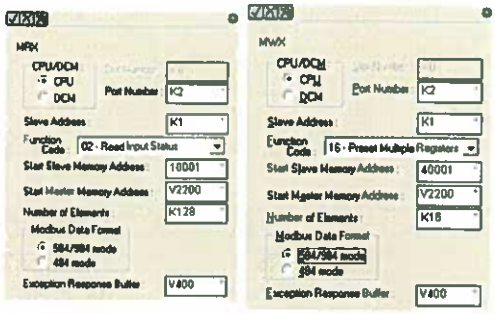
The F0-CP128 option module is also available for more extensive ASCII communications.

Modbus RTU instructions for DL06

The DL06 CPU/DCM port 2 supports Modbus Read/Write instructions that simplify setup. The MRX and MWX instructions allow you to use native Modbus addressing, eliminating the need for octal to decimal conversions.

Function Codes 05 and 06 and the ability to read Slave Exception Codes have been added. These flexible instructions allow the user to select the following parameters within one instruction window:

- 584/984 or 484 Modbus data type
- Slave node (0-247)
- Function code
- Starting master/slave memory address
- Number of bits
- Exception code starting address



Power Budgeting for the DL06

The DL06 has four option module slots. To determine whether the combination of modules you select will have sufficient power, you will need to perform a power budget calculation.

Power supplied

Power is supplied from two sources: the internal base unit power supply and, if required, an external supply (customer furnished). The D0-06xx (AC powered) PLCs supply a limited amount of 24 VDC power. The 24 VDC output can be used to power external devices.

For power budgeting, start by considering the power supplied by the base unit. All DL06 PLCs supply the same amount of 5 VDC power. Only the AC units offer 24 VDC auxiliary power.

Be aware of the trade-off between 5 VDC power and 24 VDC power. The amount of 5 VDC power available depends on the amount of 24 VDC power being used, and the amount of 24 VDC power available depends on the amount of 5 VDC power consumed. Determine the amount of internally supplied power from the table to the right.

Power required by base unit

Because of the different I/O configurations available in the DL06 family, the power consumed by the base unit itself varies from model to model. Subtract the amount of power *required by* the base unit from the amount of power *supplied by* the base unit. Be sure to subtract 5 VDC and 24 VDC amounts.

Power required by option modules

Next, subtract the amount of power required by the option modules you are planning to use. Again, remember to subtract both 5 VDC and 24 VDC.

If your power budget analysis shows surplus power available, you should have a workable configuration.

DL06 Power Supplied by Base Units

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06xx	1500mA	300mA
	2000mA	200mA
D0-06xx-D	1500mA	none

DL06 Base Unit Power Required

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06AA	800mA	none
D0-06AR	900mA	none
D0-06DA	800mA	none
D0-06DD1	600mA	280mA*
D0-06DD2	600mA	none
D0-06DR	950mA	none
D0-06DD1-D	600mA	none
D0-06DD2-D	600mA	none
D0-06DR-D	950mA	none

* Only if auxiliary 24VDC power is connected to V+ terminal.

DL06 Power Consumed by Other Devices

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06LCD	50mA	none
D2-HPP	200mA	none
DV-1000	150mA	none
C-more Micro-Graphic	210mA	none

Power Budgeting Example

Power Source		5VDC power (mA)	24VDC power (mA)
D0-06DD1 (select row A or B)	A	1500mA	300mA
	B	2000mA	200mA
Current Required		**5VDC power (mA)**	**24VDC power (mA)**
D0-06DD1		600mA	280mA*
D0-16ND3		35mA	0
D0-10TD1		150mA	0
D0-08TR		280mA	0
F0-4AD2DA-1		100mA	0
D0-06LCD		50mA	0
Total Used		1215mA	280mA
Remaining	A	285mA	20mA
	B	785mA	note 1

* Auxiliary 24 VDC used to power V+ terminal of D0-06DD1 sinking outputs.

Note 1: If the PLC's auxiliary 24 VDC power source is used to power the sinking outputs, use power choice A, above.

DL05/06 Power Consumed by Option Modules

Part Number	5 VDC (mA)	24 VDC (mA)
D0-07CDR	130mA	none
D0-08CDD1	100mA	none
D0-08TR	280mA	none
D0-10ND3	35mA	none
D0-10ND3F	35mA	none
D0-10TD1	150mA	none
D0-10TD2	150mA	none
D0-16ND3	35mA	none
D0-16TD1	200mA	none
D0-16TD2	200mA	none
F0-04TRS	250mA	none
F0-08NA-1	5mA	none
F0-04AD-1	50mA	none
F0-04AD-2	75mA	none
F0-08ADH-1	25mA	25mA
F0-08ADH-2	25mA	25mA
F0-04DAH-1	25mA	150mA
F0-08DAH-1	25mA	220mA
F0-04DAH-2	25mA	30mA
F0-08DAH-2	25mA	30mA
F0-2AD2DA-2	50mA	30mA
F0-4AD2DA-1	100mA	40mA
F0-4AD2DA-2	100mA	none
F0-04RTD	70mA	none
F0-04THM	30mA	none
D0-DEVNETS	45mA	none
H0-PSCM	530mA	none
H0-ECOM	250mA	none
H0-CTRIO	250mA	none
H0-ECOM100	300mA	none
F0-08SIM	1mA	none
D0-DCM	250 mA	none
F0-CP128	150 mA	none
F0-08SIM	1 mA	none

DL06 LCD Display

The optional D0-06LCD (<---->) is a cost effective LCD display panel that is easy to install. This device is available exclusively for the DL06 PLCs.

16 X 2 backlit display

The 16 character x 2 row display mounts directly on the face of the PLC. The LCD is backlit and is accessible using the seven function keys on the front of the display.

Monitor or change data values

You can view V-memory registers, I/O status, PLC mode, or system errors without interrupting the PLC's control function.

Display messages required for alarm or monitoring purposes can be preprogrammed or imported as ASCII data.

Password protection

Two layers of password protection prevent unauthorized changes to clock and calendar setup and V-memory data values. Individuals with password authorization can change clock, calender, V-memory values, force bits on or off, etc.

One simple ladder instruction is used to set up the display. The LCD configuration instruction is available in *Direct*SOFT, version 4.0 or later.

Note: The D2-HPP handheld programmer does not support DL06 LCD configuration.

The DL06 User Manual (D0-06USER-M) describes more fully the installation and operation of the D0-06LCD. Be sure to consult this manual before installing the DL06 LCD. The manual is available free on our Web site, or it can be purchased separately.

Snap-in installation

The display installs easily into any model DL06 PLC.

Note: Remove power to the PLC before installing or removing the LCD display.

Remove the plastic cover (located between the input and output terminals) by sliding the cover to the left. In its place, slide in the LCD display until it snaps into place.

Display or change individual bits (up to 16 bits per screen) or 32-bit double word values from V-memory.

Buzzer

The piezo electric buzzer can be configured to provide pushbutton feedback.

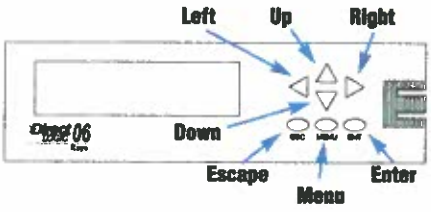
Keypad navigation

Seven function keys on the face of the LCD display provide navigation through messages or menu items. Messages fall into two categories:

- Error messages
- User-defined preprogrammed messages

At power-up the default screen is displayed. The default screen can be user-defined.

Seven menu choices allow you to view or change all accessible data values (see next page).

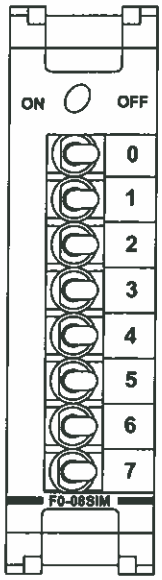


DL05/06 I/O Option Modules

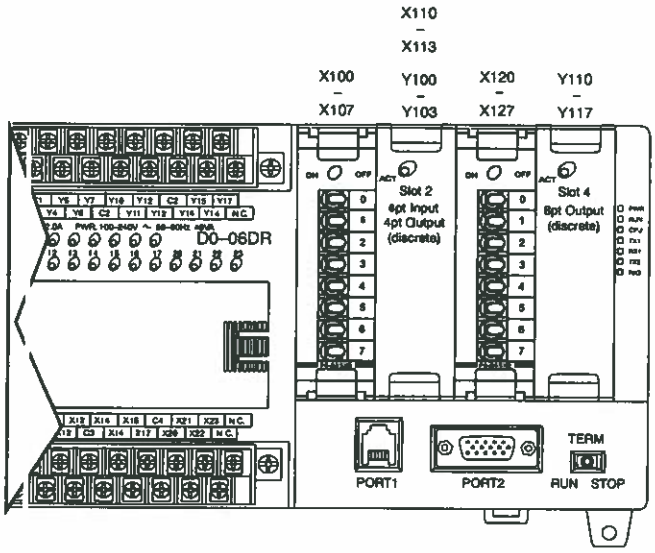
F0-08SIM <--->

8-input simulator module

F0-08SIM Input Specifications	
Number of Inputs	8
Base Power Required (5VDC)	1 mA
Terminal Type	None
Status Indicator	None
Weight	1.6 oz. (45.36 g)



F0-08SIM addressing example

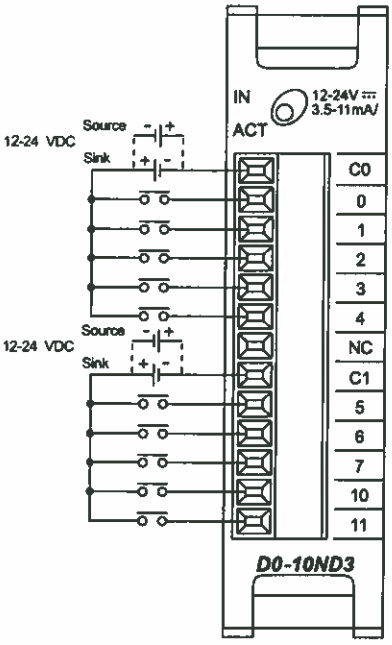


CPU	Firmware Required	DirectSOFT Required
DL05	Version 4.90 or later	Version 3.0c or later
DL06	Version 1.80 or later	Version 4.0, Build 16 or later

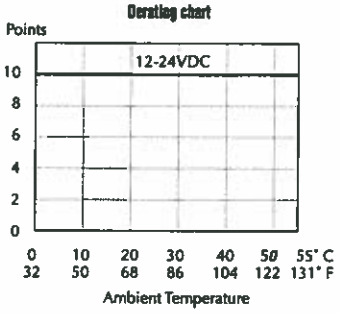
D0-10ND3 <--->

10-point DC input module

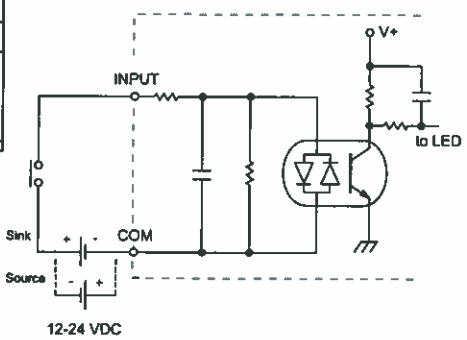
D0-10ND3 Input Specifications	
Number of Inputs	10 (sink/source)
Input Voltage Range	10.8-26.4 VDC
Peak Voltage	30.0 VDC
Input Current	Typical: 4.0 mA @ 12 VDC 8.5 mA @ 24 VDC
Maximum Input Current	11 mA @ 26.4 VDC
Input Impedance	2.8 KΩ @ 12-24 VDC
On Voltage Level	> 10.0 VDC
Off Voltage Level	< 2.0 VDC
Minimum ON Current	3.5 mA
Minimum OFF Current	0.5 mA
Off to On Response	2-8ms, Typ. 4ms
On to Off Response	2-8ms, Typ. 4ms
Status Indicators	Module activity: one green LED
Commons	2 (5 pts/common) isolated
Fuse	No fuse
Terminal Type (included)	Removable: D0-ACC-4
Base Power Required (5V)	Typical. 35 mA (all pts. on)



Derating chart



Equivalent input circuit



See page 2-68 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

For "Sinking and Sourcing Concepts", see the Appendix section in this catalog.

Wiring Solutions

Wiring Solutions using the *ZIP*Link Wiring System

*ZIP*Links eliminote the normolly tedious process of wiring between devices by utilizing prewired cobles and DIN rail mount connector modules. It's as simple as plugging in a cable connector at either end or terminating wires at only one end. Prewired cobles keep installation clean and efficient, using holf the space at a fraction of the cost of standard terminal blocks. There are severol wiring solutions available when using the *ZIP*Link System ranging from PLC I/O-to-*ZIP*Link Connector Modules thot are ready for field terminotion, options for connecting to third party devices, GS, DuraPulse and SureServo Drives, and specialty relay, transorb and communications modules. Pre-printed I/O-specific adhesive label strips for quick morking of *ZIP*Link modules are provided with *ZIP*Link cables. See the following solutions to help determine the best *ZIP*Link system for your applicotion.

Solution 1: DirectLOGIC, CLICK and Productivity3000 I/O Modules to *ZIP*Link Connector Modules

When looking for quick and easy I/O-to-field termination, a *ZIP*Link connector module used in conjunction with a prewired *ZIP*Link cable, consisting of on I/O terminol block ot one end and o multi-pin connector ot the other end, is the best solution.

Using the PLC I/O Modules to *ZIP*Link Connector Modules selector tables located in this section,

1. Locate your I/O module/PLC.
2. Select a *ZIP*Link Module.
3. Select a corresponding *ZIP*Link Cable.

Solution 2: *Direct*LOGIC, CLICK and Productivity3000 I/O Modules to 3rd Party Devices

When wanting to connect I/O to another device within close proximity of the I/O modules, no extra terminal blocks are necessory when using the *ZIP*Link Pigtoil Cables. *ZIP*Link Pigtoil Cables are prewired to an I/O terminal block with color-coded pigtoil with soldered-tip wires on the other end.

Using the I/O Modules to 3rd Party Devices selector tables locoted in this section,

1. Locate your PLC I/O module.
2. Select a *ZIP*Link Pigtail Cable that is compatible with your 3rd party device.

Solution 3: GS Series and DuraPulse Drives Communication Cables

Need to communicate via Modbus RTU to a drive or a network of drives?

*ZIP*Link cables ore ovailable in a wide range of configurotions for connecting to PLCs and SureServo, SureStep, Stellor Soft Starter ond AC drives. Add o *ZIP*Link communications module to quickly ond easily set up a multi-device network.

Using the Drives Communication selector tables located in this section,

1. Locate your Drive and type of communications.
2. Select a *ZIP*Link cable and other associated hardware.

ZIPLink Wiring Solutions

Solution 4: Serial Communications Cables

*ZIP*Link offers communications cables for use with *Direct*LOGIC, CLICK, and Productivity3000 CPUs, that can also be used with other communications devices. Connections include a 6-pin RJ12 or 9-pin, 15-pin and 25-pin D-sub connectors which can be used in conjunction with the RJ12 or D-Sub Feedthrough modules.

Using the Serial Communications Cables selector table located in this section,

1. Locate your connector type
2. Select a cable.

Solution 5: Specialty *ZIP*Link Modules

For additional application solutions, *ZIP*Link modules are available in a variety of configurations including stand-alone relays, 24VDC and 120VAC transorb modules, D-sub and RJ12 feedthrough modules, communication port adapter and distribution modules, and SureServo 50-pin I/O interface connection.

Using the *ZIP*Link Specialty Modules selector table located in this section,

1. Locate the type of application.
2. Select a ZIPLink module.

Solution 6: *ZIP*Link Connector Modules to 3rd Party Devices

If you need a way to connect your device to terminal blocks without all that wiring time, then our pigtail cables with color-coded soldered-tip wires are a good solution. Used in conjunction with any compatible *ZIP*Link Connector Modules, a pigtail cable keeps wiring clean and easy and reduces troubleshooting time.

Using the Universal Connector Modules and Pigtail Cables table located in this section,

1. Select module type.
2. Select the number of pins.
3. Select cable.

PLC I/O Modules to ZIPLink Connector Modules - DL05/06

DL05/06 PLC Input Module ZIPLink Selector				
PLC		ZIPLink		
Input Module	# of Terms	Component	Module Part No.	Cable Part No.
D0-10ND3	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
D0-10ND3F	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
D0-16ND3	24	Feedthrough	ZL-RTB20	ZL-D0-CBL24*L
		Sensor	ZL-LTB16-24	ZL-D0-CBL24*L
F0-08NA-1	10	Feedthrough	ZL-RTB20	ZL-D0-CBL10*

DL05/06 PLC Combo In/Out Module ZIPLink Selector				
PLC		ZIPLink		
Combo Module	# of Terms	Component	Module Part No.	Cable Part No.
D0-07CDR	10	Feedthrough	ZL-RTB20	ZL-D0-CBL10*
D0-08CDD1	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*

DL05/06 PLC Analog Module ZIPLink Selector				
PLC		ZIPLink		
Analog Module	# of Terms	Component	Module	Cable
F0-04AD-1	8	Feedthrough	ZL-RTB20	ZL-D0-CBL8*
F0-04AD-2	8	Feedthrough	ZL-RTB20	ZL-D0-CBL8*
F0-08ADH-1	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-08ADH-2	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-04DAH-1	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-08DAH-1	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-04DAH-2	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-08DAH-2	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
F0-2AD2DA-2	8	Feedthrough	ZL-RTB20	ZL-D0-CBL8*
F0-4AD2DA-1	8	Feedthrough	ZL-RTB20	ZL-D0-CBL8*
F0-4AD2DA-2	8	Feedthrough	ZL-RTB20	ZL-D0-CBL8*
F0-04RTD[2]	Matched Only	See Note 2		
F0-04THM[2]	Matched Only	See Note 2		

NOTE: ZIPLINK CONNECTOR MODULES SPECIFICATIONS FOLLOW THE COMPATIBILITY MATRIX TABLES. ZIPLINK CABLES SPECIFICATIONS ARE AT THE END OF THIS ZIPLINK SECTION.

DL05/06 PLC Output Module ZIPLink Selector				
PLC		ZIPLink		
Output Module	# of Terms	Component	Module Part No.	Cable Part No.
D0-10TD1	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
D0-16TD1	24	Feedthrough	ZL-RTB20	ZL-D0-CBL24*
		Fuse	ZL-RFU20[3]	ZL-D0-CBL24*
		Relay (sinking)	ZL-RRL16-24-1	ZL-D0-CBL24*
D0-10TD2	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*
D0-16TD2	24	Feedthrough	ZL-RTB20	ZL-D0-CBL24*
		Fuse	ZL-RFU20[3]	ZL-D0-CBL24*
		Relay (sourcing)	ZL-RRL16-24-2	ZL-D0-CBL24*
D0-06TR	10	Feedthrough	ZL-RTB20	ZL-D0-CBL10*
F0-04TRS[1]	13	Feedthrough	ZL-RTB20	ZL-D0-CBL13*

DL05/06 PLC Fixed I/O ZIPLink Selector				
PLC		ZIPLink		
PLC	# of Terms	Component	Module Part No.	Cable Part No.
DL05	18	Feedthrough	ZL-RTB20	ZL-D05-CBL18*
DL06	20 (Input side only)	Feedthrough	ZL-RTB20	ZL-D06X-CBL20*
	20 (Output side only)	Feedthrough	ZL-RTB20	ZL-D06Y-CBL20*

** Select the cable length by replacing the * with: Blank = 0.5m, -1 = 1.0m, or -2 = 2.0m.*

[1] Caution: The F0-04TRS relay outputs are derated not to exceed 2A per point when used with the ZIPLink wiring system.

[2] These modules are not supported by the ZIPLink wiring system.

[3] Note: Fuses (5 x 20 mm) are not included. See Edison Electronic Fuse section for (5 x 20 mm) fuse. S500 and GMA electronic circuit protection for fast-acting maximum protection. S506 and GMC electronic circuit protection for time-delay performance. Ideal for inductive circuits.
To ensure proper operation, do not exceed the voltage and current rating of ZIPLink module. ZL-RFU20 = 2A per circuit; ZL-RFU40 = 400 mA per circuit.

Power Budgeting for the DL06

The DL06 has four option module slots. To determine whether the combination of modules you select will have sufficient power, you will need to perform a power budget calculation.

Power supplied

Power is supplied from two sources: the internal base unit power supply and, if required, an external supply (customer furnished). The D0-06xx (AC powered) PLCs supply a limited amount of 24 VDC power. The 24 VDC output can be used to power external devices.

For power budgeting, start by considering the power supplied by the base unit. All DL06 PLCs supply the same amount of 5 VDC power. Only the AC units offer 24 VDC auxiliary power.

Be aware of the trade-off between 5 VDC power and 24 VDC power. The amount of 5 VDC power available depends on the amount of 24 VDC power being used, and the amount of 24 VDC power available depends on the amount of 5 VDC power consumed. Determine the amount of internally supplied power from the table to the right.

Power required by base unit

Because of the different I/O configurations available in the DL06 family, the power consumed by the base unit itself varies from model to model. Subtract the amount of power *required by* the base unit from the amount of power *supplied by* the base unit. Be sure to subtract 5 VDC and 24 VDC amounts.

Power required by option modules

Next, subtract the amount of power required by the option modules you are planning to use. Again, remember to subtract both 5 VDC and 24 VDC.

If your power budget analysis shows surplus power available, you should have a workable configuration.

DL06 Power Supplied by Base Units

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06xx	1500mA	300mA
	2000mA	200mA
D0-06xx-D	1500mA	none

DL06 Base Unit Power Required

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06AA	800mA	none
D0-06AR	900mA	none
D0-06DA	800mA	none
D0-06DD1	600mA	280mA*
D0-06DD2	600mA	none
D0-06DR	950mA	none
D0-06DD1-D	600mA	none
D0-06DD2-D	600mA	none
D0-06DR-D	950mA	none

* Only if auxiliary 24VDC power is connected to V+ terminal.

DL06 Power Consumed by Other Devices

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06LCD	50mA	none
D2-HPP	200mA	none
DV-1000	150mA	none
C-more Micro-Graphic	210mA	none

Power Budgeting Example

Power Source		5VDC power (mA)	24VDC power (mA)
D0-06DD1 (select row A or B)	A	1500mA	300mA
	B	2000mA	200mA
Current Required		**5VDC power (mA)**	**24VDC power (mA)**
D0-06DD1		600mA	280mA*
D0-16ND3		35mA	0
D0-10TD1		150mA	0
D0-08TR		280mA	0
F0-4AD2DA-1		100mA	0
D0-06LCD		50mA	0
Total Used		1215mA	280mA
Remaining	A	285mA	20mA
	B	785mA	note 1

* Auxiliary 24 VDC used to power V+ terminal of D0-06DD1 sinking outputs.

Note 1: If the PLC's auxiliary 24 VDC power source is used to power the sinking outputs, use power choice A, above.

DL05/06 Power Consumed by Option Modules

Part Number	5 VDC (mA)	24 VDC (mA)
D0-07CDR	130mA	none
D0-08CDD1	100mA	none
D0-08TR	280mA	none
D0-10ND3	35mA	none
D0-10ND3F	35mA	none
D0-10TD1	150mA	none
D0-10TD2	150mA	none
D0-16ND3	35mA	none
D0-16TD1	200mA	none
D0-16TD2	200mA	none
F0-04TRS	250mA	none
F0-08NA-1	5mA	none
F0-04AD-1	50mA	none
F0-04AD-2	75mA	none
F0-08ADH-1	25mA	25mA
F0-08ADH-2	25mA	25mA
F0-04DAH-1	25mA	150mA
F0-08DAH-1	25mA	220mA
F0-04DAH-2	25mA	30mA
F0-08DAH-2	25mA	30mA
F0-2AD2DA-2	50mA	30mA
F0-4AD2DA-1	100mA	40mA
F0-4AD2DA-2	100mA	none
F0-04RTD	70mA	none
F0-04THM	30mA	none
D0-DEVNETS	45mA	none
H0-PSCM	530mA	none
H0-ECOM	250mA	none
H0-CTRID	250mA	none
H0-ECOM100	300mA	none
F0-08SIM	1mA	none
D0-DCM	250 mA	none
F0-CP128	150 mA	none
F0-08SIM	1 mA	none

DL05/06 Ethernet Communications Modules

Ethernet Communications Modules

H0-ECOM100 <--->

Overview

Ethernet Communications Modules offer features such as:

- High-speed peer-to-peer networking of PLCs
- Fast updates with *Direct*SOFT Programming Software
- High-performance access for Human Machine Interface (HMI), ERP, MES or other Windows-based software
- Industry standard Modbus TCP Client/Server Protocol
- Free SDK for custom drivers
- Easy setup

The Ethernet Communication (ECOM) Modules represent a price breakthrough for high-speed peer-to-peer networking of PLCs. No longer are you forced to designate a single PLC to be the network master. Any PLC can initiate communications with any other PLC. Link your PLCs with PCs using industry standard Modbus TCP protocol connected through standard cables, hubs, and repeaters. Or, use our KEP*Direct* I/O Server to link your favorite HMI/SCADA, data historian, MES or ERP software to *Direct*LOGIC PLCs. Our Lookout*Direct* HMI and our DataWorx data collection software include ECOM drivers. *Direct*SOFT Programming Software can be used to monitor or update the program in any *Direct*LOGIC PLC on the network.

Simple connections

Use Category 5 UTP cables which can be run up to 100 meters between nodes. Use repeaters to extend distances and expand the number of nodes.

Our HA-TADP (10/100BaseT) PC network adapter card is compatible with the H0-ECOM100. See the Communications Products section for information on the adapter card.

Choose your slot

The H0-ECOM100 module plugs into any option module slot of any DL05 PLC or DL06 PLC. The module maintains identification data, descriptive information, and communication parameters for PLC-to-PLC communications in flash memory. Disconnect power before installing or removing any PLC module.

Specifications	H0-ECOM100
Communications	10/100 BaseT Ethernet
Data Transfer Rate	100 Mbps
Link Distance	100 meters
Ethernet Port	RJ45
Ethernet Protocols	TCP/IP, IPX, Modbus TCP/IP DHCP, HTML Configuration
Power Consumption	300mA @ 5 VDC
Manufacturer	Host Automation Products, LLC

CPU	Firmware Required	DirectSOFT Required
DL05	ECOM100: Version 4.90 or later ECOM (retired): Version 4.60 or later	Version 3.0c or later
DL06	ECOM100: Version 1.80 or later ECOM (retired): Version 1.40 or later	Version 4.0, Build 16 or later

H0-ECOM100 *IBox* communications instructions

Over 25 Communications *IBox* instructions are available when using the H0-ECOM100 with a DL05/06 PLC and *Direct*SOFT5 programming software. These easy-to-use instructions allow you to:

- Enable/disable module DHCP
- Read/write module IP, Gateway and Subnet Mask addresses
- Read/write module ID, Name and Description
- Send E-mail messages
- Read/Write PLC memory to networked Hx-ECOM100 modules
- Read/Write PLC memory to networked Hx-ECOM(-F) modules

See the following page for example Communications *IBox* instructions.

The H0-ECOM100 supports the Industry Standard Modbus TCP Client/Server Protocol

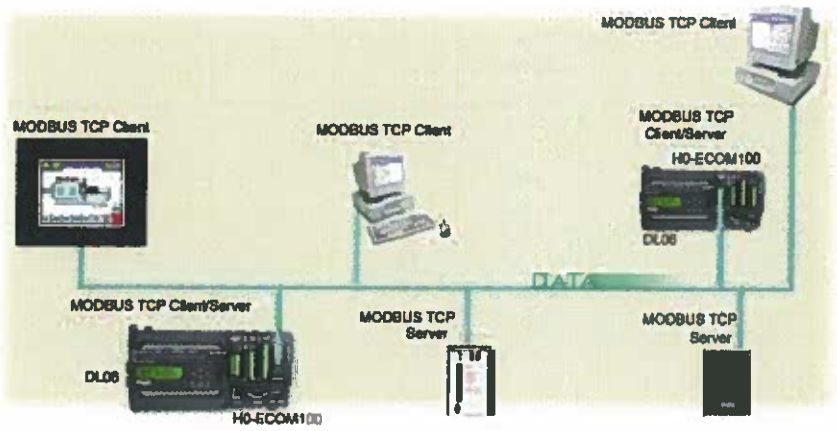
See the Communications section for details on the Stride Ethernet Switch

DL05/06 Ethernet Communications Modules

Modbus TCP support

The H0-ECOM100 supports the industry standard Modbus TCP Client/Server protocol in addition to the standard IP and IPX protocols. This allows the DL06/06 PLC with an H0-ECOM100 module to serve as a client (master) or as a server (slave) on a Modbus TCP Ethernet network. The H0-ECOM100 can actively issue Modbus commands to other nodes or devices on the Modbus TCP network or simply respond to connected Modbus TCP clients.

ModbusTCP communications architecture



PLC-to-PLC communications

PLC-to-PLC or PLC to a Modbus TCP device communications can be accomplished using standard Read from Network (RX) and Write to Network (WX) instructions (all DL05/06 PLCs, all H0 series ECOMs and all *Direct*SOFT versions). If you're using our *Direct*SOFT5 programming software, a DL05 or DL06 PLC and an H0-ECOM100, you can use fill-in-the-blank *IBox* instructions to simplify your communications programming. The H0-ECOM100 supports the ECOM100 Configuration *IBox* for use with the ECRX and ECWX *IBox* instructions to read/write to other ECOM100s. All H0 series ECOM modules support the NETCFG Configuration *IBox* for use with the NETRX and NETWX *IBox* instructions to read/write to other ECOM modules (remember *Direct*SOFT5 is required). The Communications *IBox* instructions execute with built-in interlocking to greatly simplify communications programming.

ECOM100 Configuration IBox

ECOM100 Config

ECOM100	IB-710
ECOM100 #	K0
Slot	K1
Status	V2000
Workspace	V2100
Msg Buffer (65 WORDs)	V2000

ECOM100 Read Network IBox

ECOM100 RX Network Read

ECRX	IB-740
ECOM100 #	K0
Workspace	V2200
Slave ID	K0
From Slave Element (Src)	C0
Number Of Bytes	K1
To Master Element (Dest)	V2000
Success	C0
Error	C0

NetEdit3 software

NetEdit3 Software ships free with the ECOM User Manual. Use NetEdit3 to configure the ECOM modules for your network. Flexible addressing allows you to use your choice of protocols and identifying methods. Assign each module a number or a name or both. You don't have to use an IP address, but you can if it's necessary for your network. NetEdit3 uses two protocols for PC-to-PLC communications: IPX and TCP/IP. The NetEdit3 screen displays all identifiers and troubleshooting information for each module on the network. You can use NetEdit3 to adjust parameters for PLC-to-PLC communications by clicking on Advanced Settings. The network identifiers can also be changed from *Direct*SOFT Programming Software.

H0-ECOM100 has e-mail capability!

The H0-ECOM100 Send EMail (ECEMAIL) *IBox* instruction will allow the module to behave as an e-mail client and send an SMTP request to your SMTP Server to send a specified e-mail message to the e-mail addresses in the *IBox*'s To: field. The Body: field allows you to embed real-time data in your e-mail message. *Direct*SOFT5 is required to use the *IBox* instructions.

ECOM100 Send EMail IBox

ECOM100 Send EMail

ECEMAIL	IB-711
ECOM100 #	K0
Workspace	V2200
Success	C0
Error	C1
Error Code	V2100
To	docteam@work.com
Subject	Team Busy
Body	"Machine # V5010:8 "went offline at" _time:24 "on" _date:us

Power Budgeting for the DL06

The DL06 has four option module slots. To determine whether the combination of modules you select will have sufficient power, you will need to perform a power budget calculation.

Power supplied

Power is supplied from two sources: the internal base unit power supply and, if required, an external supply (customer furnished). The D0-06xx (AC powered) PLCs supply a limited amount of 24 VDC power. The 24 VDC output can be used to power external devices.

For power budgeting, start by considering the power supplied by the base unit. All DL06 PLCs supply the same amount of 5 VDC power. Only the AC units offer 24 VDC auxiliary power.

Be aware of the trade-off between 5 VDC power and 24 VDC power. The amount of 5 VDC power available depends on the amount of 24 VDC power being used, and the amount of 24 VDC power available depends on the amount of 5 VDC power consumed. Determine the amount of internally supplied power from the table to the right.

Power required by base unit

Because of the different I/O configurations available in the DL06 family, the power consumed by the base unit itself varies from model to model. Subtract the amount of power *required by* the base unit from the amount of power *supplied by* the base unit. Be sure to subtract 5 VDC and 24 VDC amounts.

Power required by option modules

Next, subtract the amount of power required by the option modules you are planning to use. Again, remember to subtract both 5 VDC and 24 VDC.

If your power budget analysis shows surplus power available, you should have a workable configuration.

DL06 Power Supplied by Base Units

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06xx	1500mA	300mA
	2000mA	200mA
D0-06xx-D	1500mA	none

DL06 Base Unit Power Required

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06AA	800mA	none
D0-06AR	900mA	none
D0-06DA	800mA	none
D0-06DD1	600mA	280mA*
D0-06DD2	600mA	none
D0-06DR	950mA	none
D0-06DD1-D	600mA	none
D0-06DD2-D	600mA	none
D0-06DR-D	950mA	none

* Only if auxiliary 24VDC power is connected to V+ terminal.

DL06 Power Consumed by Other Devices

Part Number	5 VDC (mA)	24 VDC (mA)
D0-06LCD	50mA	none
D2-HPP	200mA	none
DV-1000	150mA	none
C-more Micro-Graphic	210mA	none

Power Budgeting Example

Power Source		5VDC power (mA)	24VDC power (mA)
D0-06DD1 (select row A or B)	A	1500mA	300mA
	B	2000mA	200mA
Current Required		**5VDC power (mA)**	**24VDC power (mA)**
D0-06DD1		600mA	280mA*
D0-16ND3		35mA	0
D0-10TD1		150mA	0
D0-08TR		280mA	0
F0-4AD2DA-1		100mA	0
D0-06LCD		50mA	0
Total Used		1215mA	280mA
Remaining	A	285mA	20mA
	B	785mA	note 1

* Auxiliary 24 VDC used to power V+ terminal of D0-06DD1 sinking outputs.

Note 1: If the PLC's auxiliary 24 VDC power source is used to power the sinking outputs, use power choice A, above.

DL05/06 Power Consumed by Option Modules

Part Number	5 VDC (mA)	24 VDC (mA)
D0-07CDR	130mA	none
D0-08CDD1	100mA	none
D0-08TR	280mA	none
D0-10ND3	35mA	none
D0-10ND3F	35mA	none
D0-10TD1	150mA	none
D0-10TD2	150mA	none
D0-16ND3	35mA	none
D0-16TD1	200mA	none
D0-16TD2	200mA	none
F0-04TRS	250mA	none
F0-08NA-1	5mA	none
F0-04AD-1	50mA	none
F0-04AD-2	75mA	none
F0-08ADH-1	25mA	25mA
F0-08ADH-2	25mA	25mA
F0-04DAH-1	25mA	150mA
F0-08DAH-1	25mA	220mA
F0-04DAH-2	25mA	30mA
F0-08DAH-2	25mA	30mA
F0-2AD2DA-2	50mA	30mA
F0-4AD2DA-1	100mA	40mA
F0-4AD2DA-2	100mA	none
F0-04RTD	70mA	none
F0-04THM	30mA	none
D0-DEVNETS	45mA	none
H0-PSCM	530mA	none
H0-CTRIO	250mA	none
H0-ECOM100	300mA	none
F0-08SIM	1mA	none
D0-DCM	250 mA	none
F0-CP128	150 mA	none
F0-08SIM	1 mA	none

Sierra Wireless AirLink™ Raven XE

Intelligent 3G Ethernet Gateway

Powerful Connectivity for Enterprise Applications

The Raven XE provides high-speed connectivity in a compact and sleek form factor for critical enterprise applications. Designed to handle rugged and robust applications, the Raven XE is ideal for fixed and portable broadband connectivity.

Powered by ALEOS™ embedded intelligence and the AirLink device management tools, the Raven XE reduces field time and enables secure date for mission critical applications.

POWERED BY: ALEOS

Download Datasheet Compare Product learn more about this product

Security	• IPsec VPN • GRE Tunnel • Friends List
Network Technology	• HSUPA (7.2 Mbps, on AT&T, Bell and Telus) With fallback to: HSDPA, UMTS, EDGE, GPRS (MS-12) North America SKUs: - Tri-Band UMTS/HSDPA/HSUPA, 850/1900/2100 MHz - Quad-Band GPRS/EDGE, 850/900/1800/1900 MHz *Note* - AT&T SKUs are SIM locked ROW SKU: - Quad-Band UMTS/HSOPA/HSUPA, 850/900/1900/2100 MHz - Quad-Band GPRS/EDGE, 850/900/1800/1900 MHz • EV-DO Rev A With fallback to: CDMA 1x, CDMA IS-95 - 800 Mhz Cellular, 1900 Mhz PCS
Operating Temperature	-30° to 70° C -22° to 158° F
Storage Temperature	-40° to 85° C -40° to 185° F
ROHS Compliant	Yes
Idle Power Consumption	
Transmit Receive Power Consumption	110 mA
Input Voltage	9 - 28V DC
Device Dimensions	Size: • 76 mm x 27 mm x 94 mm • 3.0 in x 1.1 in x 3.7 in Weight: • 200 grams • 7.1 oz
FCC Approved	Yes
Industry Canada Approved	Yes
PTCRB	Yes
	AT&T, Sprint, Verizon Wireless, Bell Mobility, TELUS, Jasper, Vodafone

Carrier Specific Approvals	
CE	Yes
Host Interfaces	• Ethernet: t0/100 Mbps RJ-45 • USB: USB 2.0 (Mini-B5) • Antenna Connections: Primary 50 Ohm SMA Rx Diversity: 50 Ohm SMA • I/O Ports: 2
Application Interfaces	• TCP/IP • UDP/IP • DHCP • HTTP • SNMP • SMTP • SMS • MSCI
LED Indicators	• Network • Signal • Activity • Power

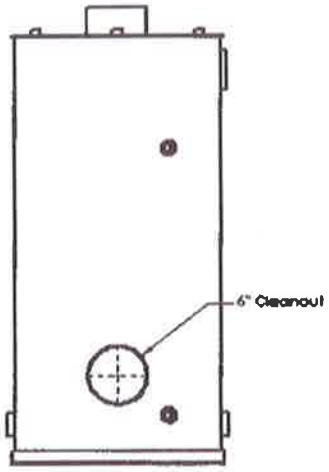
APPENDIX E VLS System Cut Sheets

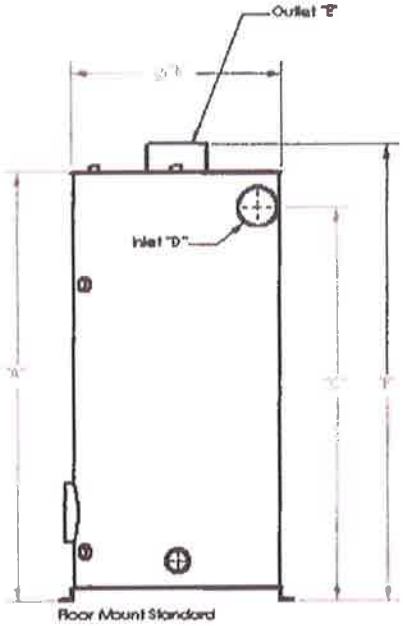
MAPLE LEAF ENVIRONMENTAL EQUIPMENT

VLW – Series Vapor Liquid Separators

Application – The VLW – Series Vapor Liquid Separator is capable of capturing entrained water from a process air stream. The separator is designed with a tangential inlet to utilize centrifugal forces to aid in the air/water separation. The water collects in the bottom of the separator while the air exits the large discharge pipe at the top.

Construction – The VLW – Series Vapor Liquid Separator is fabricated from 1/8" and 3/16" carbon steel. The exterior is epoxy coated. The separator is built standard with a 6" cleanout in the bottom to allow access to the separator interior.





Dimensions Chart: (Dimensions are in inches unless otherwise noted)

Part Number	A	B	C	D Dia.	E Dia.	F	Total Volume (Gal Imp)	Storage Volume (Gal Imp)	Shipping Weight (Lbs)
VLW-90 (CW, CCW)	46.5	24	42.5	4"	6"	50.5	90	56	250
VLW-140 (CW, CCW)	59	27	55	6"	6"	63	140	74	320
VLW-240 (CW, CCW)	59	38	53	8"	8"	63	240	118	500

MAPLE LEAF ENVIRONMENTAL EQUIPMENT

VLW – Series Vapor Liquid Separators

Specifications Chart:

Specification:	VLW-90	VLW-140	VLW-240
Inlet (inches)	4" MNPT	6" Flange	8" Flange
Outlet (inches)	6" Flange	6" Flange	8" Flange
Maximum Air Flow Rate	630 ACFM	1050 ACFM	2020 ACFM
Maximum Water Flow Rate	20 GPM	50 GPM	100 GPM
Maximum Operating Vacuum	29" HG	29" HG	29" HG
Pressure Drop at Maximum Air Flow (dp=constant x velocity^2)	10"wc	15"wc	20"wc
Removal Efficiency without Demister*	96%	96%	96%
Removal Efficiency with Demister*	99.9%	99.9%	99.9%

*Note: Removal Efficiency is measured as a % of the total incoming water that is larger than 20 microns in size.

Standard Features:

- Carbon steel construction
- 6" cleanout with plug
- MLEE blue urethane exterior
- Floor mounting brackets
- 1.5" drain coupling
- Baffle welded into base to reduce cyclonic swirling of water
- ½" FNPT coupling on top of separator for vacuum gauge
- Brackets are standard to mount an optional demister element
- 1" couplings for installation of sight glass

Optional Features:

Option	Description
Orientation: CW or CCW	This determines which side of the separator the inlet pipe comes in on. CW indicates that the air flows around the separator in a clockwise motion. CCW indicates counter clockwise motion.
Demister	A demister pad is installed in the separator. This will capture an additional 98% of the water droplets greater than 20 microns that would otherwise be entrained in the air stream leaving the separator. The pad must be purchased for this option but the standard separator comes with the mounting brackets so the pad can be retrofitted afterwards if needed.
Sight Glass	Addition of a sight glass to the VLW assembly, including isolation valves for removal during cleaning.
Level Control	Includes a sight glass as described above with a column style level switch mounted inside (one to four position switch available).
Adaptor Connections	Adaptor connections for inlet and outlet connections are available to make the transition easier. Available sizes include 6" flange x 4" FNPT and 8" flange x 6" FNPT.
Materials of Construction	Each separator can be purchased in various grades of stainless steel as well as the standard carbon steel.

Your Local Representative:

Model L6 FLOTECT® Float Switch

Specifications - Installation and Operating Instructions

Explosion-Proof; UL and CSA Listed -
Class I, Groups *A, B, C, & D
Class II, Groups E, F & G
Directive 94/9/EC (ATEX) Compliant for CE
II 2 G Ex d IIC T6 Gb Process Temp≤75°C
IECEx Compliant for Ex d IIC T6 Gb Process Temp≤75°C
***(Group A, stainless steel body only)**

SPECIFICATIONS

Service: Liquids compatible with wetted materials.

Wetted Materials:
Float: Solid polypropylene or 304 SS.
Lower Body: Brass or 303 SS.
Magnet: Ceramic.
External Float Chamber (Tee): Matches lower body choice of brass or 303 SS.
Other: Lever Arm, Spring, Pin, etc.: 301 SS.

Temperature Limit: -4 to 220°F (-20 to 105°C) Standard, MT high temperature option 400°F (205°C)(MT not UL, CSA, ATEX or IECEx). ATEX compliant AT and IECEx IEC option ambient temperature -4 to 167°F (-20 to 75°C) process temperature: -4 to 220°F (-20 to 105°C).

Pressure Limits: See next page

Enclosure Rating: Weatherproof and Explosion-proof. Listed with UL and CSA for Class I, Groups A, B, C and D. Class II, Groups E, F, and G (Group A on stainless steel body models only). CE 0344 II 2 G Ex d IIC T6 Gb Process Temp≤75°C.

EC-Type Certificate No. KEMA 04ATEX2128.

ATEX Standards: EN 60079-0 2009, EN60079-1: 2007.

IECEx Certified: For Ex d IIC T6 Gb Process Temp≤ 75°C.

IECEx Certificate of Conformity: IECEx DEK II 0039.

IECEx Standards: IEC 60079-00 2007; IEC 60079-1: 2007.

Switch Type: SPDT snap switch standard, DPDT snap switch optional.

Electrical Rating: UL models: 5A @ 125/250 VAC (V~). CSA, ATEX and IECEx models: 5A @ 125/250 VAC (V~); 5A res., 3A ind. @ 30 VDC (V⎓). MV option: .1A @ 125 VAC (V~). MT option: 5A @125/250 VAC (V~) [MT option not UL, CSA, ATEX or IECEx].

Electrical Connections: UL models: 18 AWG, 18" (460 mm) long. ATEX/CSA/IECEx models: terminal block.

Upper Body: Brass or 303 SS.

Conduit Connection: 3/4" male NPT standard, 3/4" female NPT on junction box models

Process Connection: 1" male NPT on models without external float chamber, 1" female NPT on models with external float chamber

Mounting Orientation: Horizontal with index arrow pointing down.

Weight: Approximately 1 lb (.5 kg) without external float chamber, 1.75 lb (.8 kg) with external float chamber.

Specific Gravity: See next page.

Example	L6	EP	B	B	S	3	B	MT		L6EPB-B-S-3-B-MT level switch: brass upper housing, brass lower housing, brass tee with Polypropylene spherical float, SPDT snap switch, and high temperature option
Series	L6									Series L6 level switch
Construction		EP								Explosion proof and weatherproof
Upper Body Material			B							Brass
			S							303 Stainless Steel
Lower Body Material				B						Brass
				S						303 Stainless Steel
Circuit (Switch) Type					S					SPDT
					D					DPDT
Line Size						3				1" NPT
						4				1-1/4" NPT (No tee models only)
						5				1-1/2" NPT (No tee models only)
						6				2" NPT
Tee and Float Options							0			No Tee, Solid Polypropylene Spherical Float*
							A			No Tee, 304 SS Cylindrical Float
							B			Brass Tee, Solid Polypropylene Spherical Float*
							C			No Tee, 304 SS Spherical Float
							H			Brass Tee, 304 SS Spherical Float
							L			303 SS Tee, 304 SS Spherical Float
							S			303 SS Tee, Solid Polypropylene Spherical Float*
Switch Options								MT		Gold Contacts on snap switch for dry circuits (see specifications for ratings)
								MV		High Temperature switch rated 400°F (205°C) (see specifications for ratings)*
Options									AT	ATEX approved construction (with JCT option standard)
									CSA	CSA approved construction (with JCT option standard)*
									IEC	IECEx approved construction (with JCT option standard)
									GL	Ground Lead*
									ID	Customer information on standard nameplate
									JCT	Weatherproof and explosion-proof junction box*
									JCTLH	Weatherproof and explosion-proof junction box, left side
									TBC	Terminal Block Connector*
									TOP	Top Mounted (No tee models only)*

* Options that do not have ATEX or IECEx

Attention: Units without the "AT" suffix are not Directive 94/9/EC (ATEX) compliant. These units are not intended for use in potentially hazardous atmospheres in the EU. These units may be CE marked for other Directives of the EU.

W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
P.O. BOX 368 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

MAXIMUM PRESSURE CHART

Model Number	Float	Pressure Rating psig (kg/cm²)
L6EPB-B-S-3-A	Cylindrical SS	200 (13.8)
L6EPB-B-S-3-B	Polypropylene	250 (17.2)
L6EPB-B-S-3-C	Round SS	350 (24.1)
L6EPB-B-S-3-H	Round SS	250 (17.2)
L6EPB-B-S-3-O	Polypropylene	1000 (69)
L6EPB-S-S-3-A	Cylindrical SS	200 (13.8)
L6EPB-S-S-3-C	Round SS	350 (24.1)
L6EPB-S-S-3-L	Round SS	350 (24.1)
L6EPB-S-S-3-O	Polypropylene	2000 (138)
L6EPB-S-S-3-S	Polypropylene	2000 (138)

INSTALLATION

Unpack switch and remove any packing material found inside lower housing or float chamber.

Switch must be installed with body in a horizontal plane and arrow on side pointing down.

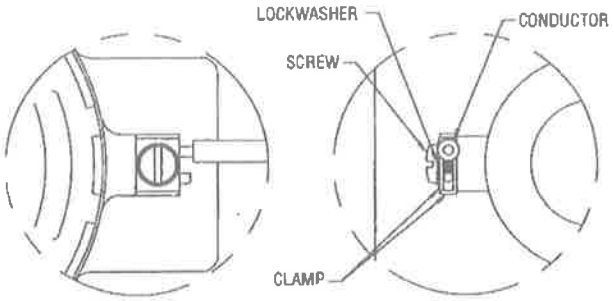
If switch has an external float chamber (tee), connect it to vertical sections of 1" NPT pipe installed outside vessel walls at appropriate levels. If unit has no external float chamber, it must be mounted in a 1" NPT half coupling welded to the vessel wall. The coupling must extend through the wall.

Inspect and clean wetted parts at regular intervals.

ELECTRICAL CONNECTIONS

Connect wire leads in accordance with local electrical codes and switch action required. N.O. contacts will close and N.C. contacts will open when liquid level causes float to rise. They will return to "normal" condition on decreasing liquid level. Black = common, Blue = N.O. and Red = N.C.

For units supplied with both internal ground and external bonding terminals, the ground screw inside the housing must be used to ground the control. The external bonding screw is for supplementary bonding when allowed or required by local code. When external bonding conductor is required, conductor must be wrapped a minimum of t80° about the external bonding screw. See below. Some CSA listed models are furnished with a separate green ground wire. Such units must be equipped with a junction box, not supplied but available on special order.



FRONT VIEW DETAIL SIDE VIEW DETAIL

EC-Type Certificate Installation Instructions:

Cable Connection

The cable entry device shall be certified in type of explosion protection flameproof enclosure "d", suitable for conditions of use and correctly installed. For Ta ≥ 65°C cable and cable gland rated ≥ 90°C shall be used.

Conduit Connection

An Ex d certified sealing device such as a conduit seal with setting compound shall be provided immediately to the entrance of the valve housing. For Ta ≥ 65°C wiring and setting compound, in the conduit seal, rated ≥ 90°C shall be used.

WETTED MATERIALS CHART

Model	Brass	Bronze	Ceramic	Polypropylene	301SS	303SS	304SS
B-S-3-A	X		X		X		X
B-S-3-B	X	X	X	X	X		
B-S-3-C	X		X		X		X
B-S-3-H	X	X	X		X		
B-S-3-O	X		X	X	X		
S-S-3-A			X	X	X		X
S-S-3-C			X		X	X	X
S-S-3-L			X		X	X	X
S-S-3-O			X	X	X	X	
S-S-3-S			X	X	X	X	

Note: ATEX and IECEx units only: The temperature class is determined by the maximum ambient and or process temperature. Units are intended to be used in ambient of -20°C≤ Tamb ≤75°C. Units may be used in process temperatures up to 105°C providing the enclosure and switch body temperatures do not exceed 75°C. The standard Temperature Class is T6 Process Temp ≤75°C.

Refer to Certificate No: IECEx DEK t1.0039 for conditions of safe use for IECEx compliant units.

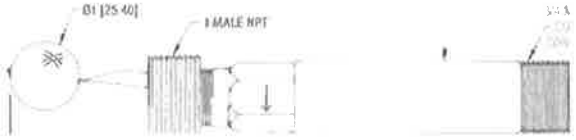
All wiring, conduit and enclosures must meet applicable codes for hazardous areas. Conduits and enclosures must be properly sealed. For outdoor or other locations where temperatures vary widely, precautions should be taken to prevent condensation inside switch or enclosure. Electrical components must be kept dry at all times.

CAUTION: To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in use.

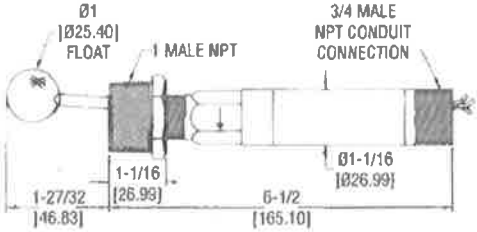
MAINTENANCE

Inspect and clean wetted parts at regular intervals. The cover should be in place at all times to protect, the internal components from dirt, dust and weather and to maintain hazardous location ratings. Disconnect device from the supply circuit before opening to prevent ignition of hazardous atmosphere. Repairs to be conducted by Dwyer Instruments, Inc. Units in need of repair should be returned to the factory prepaid.

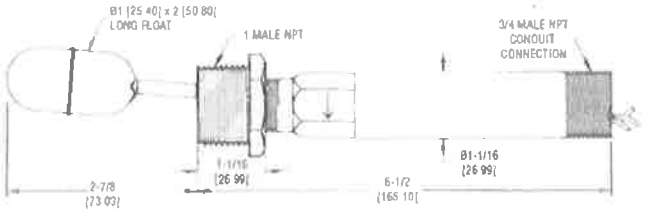
FLOTECT® MODEL L-6 FLOAT SWITCH — DIMENSION DRAWINGS



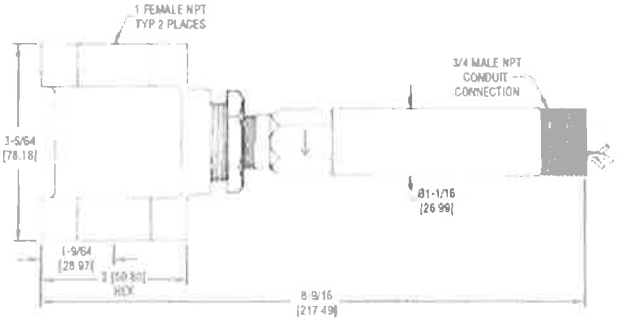
Polypropylene Float



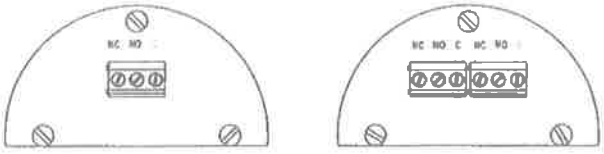
Round Stainless Steel Float



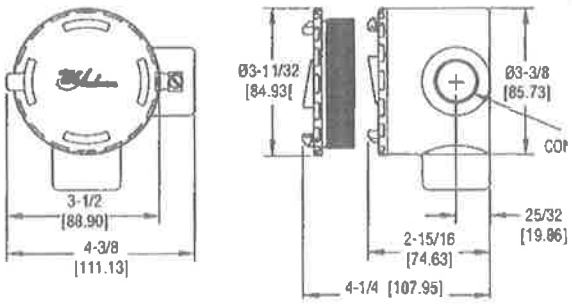
Cylindrical Stainless Steel Float



With External Chamber (Tee)



Terminal Connections CSA, ATEX Enclosures



CSA, ATEX Conduit Enclosure

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GOULDS Pump, Straight Center Discharge, 1 HP, 3Ph

Pumps > Centrifugal Pumps > Straight Center Discharge Pumps

Centrifugal Pump, Straight Center Discharge, 1 HP, 3 Phase, Voltage 208-230/460, Amps 4.0-4.0/2.0, 60 Hz, Inlet 1-1/4 In., Outlet 1 In., Motor Enclosure TEFC, NEMA/IEC Frame 56J, Motor RPM 3500, Wetted Materials ANSI 316L SS, Impeller Material 316 SS, Housing Material 316 SS, Seal Material Silicon Carbide, Viton And Stainless Steel, Max. Liquid Temp. 212 F, Max. Head 115 Ft.

Grainger Item #	6NZN3
Price (ea.)	$777.50
Brand	GOULDS
Mfr. Model #	1ST1E5C4
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	38.35
Availability	Ready to Ship
Catalog Page No.	N/A
Country of Origin (Country of Origin is subject to change.)	USA

Enlarge Image

Qty.

Add Grainger TripleGuard® repair & replacement coverage for $129.00 each

Add to Order | Add to Personal List

Price shown may not reflect your price. Sign in or register

When can I get it? Use your ZIP code to estimate availability

Qty. ZIP code: Go

Tech Specs | Additional Information | Compliance & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products | Repair Parts

Item	Centrifugal Pump
Type	Straight Center Discharge
HP	1
Phase	3
Voltage	208-230/460
Amps	4.0-4.0/2.0
Hz	60
Inlet (in.)	1-1/4
Outlet (in.)	1
Motor Enclosure	TEFC
NEMA/IEC Frame	56J
Motor RPM	3500
Wetted Materials	ANSI 316L SS
Impeller Material	316 SS
Housing Material	316 SS
Volute Material	316 SS
Shaft Material	AISI 316 SS
Shaft Size (in.)	5/8
Screw Material	323 SS
Seal Type	Type 21 Mechanical
Seal Material	Silicon Carbide, Viton And Stainless Steel
Seal Application	Water
Bearings	Ball/Ball
Max. Liquid Temp. (F)	212
GPM of Water @ 70 Ft. of Head	42
GPM of Water @ 80 Ft. of Head	35
GPM of Water @ 90 Ft. of Head	27
GPM of Water @ 100 Ft. of Head	19
GPM of Water @ 110 Ft. of Head	5
Max. Head (Ft.)	115
Best Efficiency GPM @ Head (Ft.)	33 @ 82
Max. Specific Gravity	1
Max. Fluid Viscosity	1.0
Impeller Type	Closed
Bearing Type	Ball
Duty	Continuous
Max. Pressure (PSI)	125
Port Rotation	9
Drain Plug	Yes
Length (in.)	17-3/8
Height (in.)	8-5/8
Width (in.)	8-1/8
For Use With	Water
Manufacturers Warranty Length	1 Year

Customers Also Viewed

Disposer, Waste
Brand: IN-SINK-ERATOR
Grainger Item #: 5H975
Price: $2,543.00
Qty: Add to Order

Pump, Jet, Shallow Well
Brand: DAYTON
Grainger Item #: 1D880
Price: $350.50
Qty: Add to Order

Gas Tubing, Yellow, 0.625 in OD, 150 Ft
Brand: ENDOT
Grainger Item #: 4EHF6
Price: $69.05
Qty: Add to Order

4 Tool Combo Kit W/Impact Drvr, 20 V, 3A
Brand: DEWALT
Grainger Item #: 11A162
Price: $569.00
Qty: Add to Order

APPENDIX F System Field Test Checklist

System Field Test Checklist

This purpose of this report is to test the functionality of electrical, control, and mechanical components to ensure the system operates as originally designed. This testing is then documented so it can be referenced at a later date if needed.

The following field test records must be completed by the startup technician on site before operating the process system. This is the last quality check ensuring the process equipment is ready for continuous operation.

MLE highly recommends that the system is started by a MLE factory trained startup technician to ensure the long term success of your project. We understand that this may not always be feasible in which case we would require a highly skilled technician capable of troubleshooting both mechanical and electrical aspects of a process treatment system and be familiar with our manual, equipment and capable of training the operator on operating and maintenance requirements of the treatment system.

This checklist must be sent back to Product Support department at MLE to validate your equipment warranty which begins on the date of shipment from the factory. It can be sent back in one of the following methods:

Email: service@mleequipment.com

Fax: Att: Product Support
(613) 345 7633
If you choose to fax the document then, please follow up with an email explaining that a fax was sent so we can ensure that we received the fax and properly validated the equipment warranty.

Project number: _____
Project name: _____

Tested By: _____
Company: _____
Date Tested: _____

Minimum Tools Required:

Clamp style amp meter	Socket Set
Multi meter for AC/DC Volts and ma signals	Wire Cutters
Instrumentation Screw Driver	Wire Strippers
Screw Driver Set	Channel Locks
Wrench Set	Pipe Wrenches
Straight Edge for Aligning couplings and belts	

Testing Checklist	Ck	Initial	Date
Verify site power per system design criteria			
Verify building process flow and instrumentation matches P +ID drawing, check off drawing components against actual (preferably with the customer present)			
Ensure all unions are tight, as some are loosened to prevent stress in shipping.			
Site voltage measured: L1/L2_____ L2/L3_____ L3/L1_____ L1/GRD_____ L2/GRD_____ L3/GRD_____			
Check field wiring and piping as per drawings			
Check panel for lose wiring			
Tighten all terminals where wires are terminated			
Check alignment of motors			
Check all motor belt tensions			
Check to ensure all piping unions are tight			
Check voltage on AC step down transformer			
Check voltage on DC transformer			
Check I.S. barrier is grounded as per input drawing 3.6			
Check voltage + amperage + name plate info against MLEE mechanical test record on all motors			
Manually test inputs as per input table			
Manually test control logic for each output			
Manually test all shut down alarms			
Manually test that non-critical alarms do not shut down SVE			
Run through complete logic and alarm sequence with customer and make allowable changes.			
Note name of individual and company with whom logic was reviewed:			
Test that incoming power has correct phase sequence. Bump a safe 3 phase motor to test rotation.			
Check rotation of all motors that were field wired.			
Check that PLC Run light is on and the stop/term/run switch is in term			
Check connections of all field wiring to ensure it was completed per the electrical drawings and per the NEC.			

System Field Test Record

Testing Checklist	Ck	Initial	Date
Fill out mechanical test record on each motor and check amperage and voltage. Document amperage on the System test records in the operating manual in the Field test load section.			
Check overload settings for all motors			
Test analogue inputs			
Check/Install filter bag in bag filters			
Install louver hoods on system			
Wet test all control inputs and outputs			
Wet test all shut down alarms			
Check systems for leaks (liquid and vapor)			
Test operation of building exhaust fan			
Test operation of building heater			
Test position of ball float switches for proper start/stop level			
Test vacuum and pressure relief valve			
Test air stripper and discharge pump operating sequence			
Check flow rate on all pulse meters such that digital and analogue reading increment at the same rate			
Test phone line and record phone number			
Site Number:			
Test remote access			
Test operation of Auto dialer and program if necessary.			
Run system in full automatic			
Check flow rate discharging from VLS, should maximize flow to prevent a high level shutdown. If you have a centrifugal pump ensure flow rate is low enough to prevent cavitation on the inlet under vacuum.			
Check the skimmer on the oil water separator, should be ½" above water level when water is flowing at full speed. Adjust if necessary.			
Check water flow rate into stripper, should be set to			

minimum flow to keep up with incoming water to maximize contact time in the air stripper. Adjust flow rate if necessary.			
Check flow rate exiting the air stripper, if there is no carbon filters down stream then allow pump to discharge at maximum flow rate. If carbon vessels are installed, then set pump flow rate to the			

APPENDIX G SVE System Maintenance Activities Document

Project Maintenance Document 08-Dec-11

201097 Shell Products – Roxana
Customer: Rick Homer URS Corporation

Warning: This document does not replace the manufacturer's recommended maintenance schedules as referenced in the OM manual provided by the equipment manufacturer. It is provided as a quick guide to required OM activities for this project.

General Maintenance Activities

Daily

- Check the control panel for running status.
- Contact the system remotely to check system operation for:
  - Alarms
  - Operating Conditions
- Monitor VLS filter pressure differential. Change filters as needed.

Weekly

- Check for Leaks.
- Check the volume of consumables; i.e., Chemicals, oil, etc
- Check for excessive noise of various components.
- Check for Alarms.
- Check and record Flow Rates, Vacuums, Pressures, Temperatures, pH.
- Check for excessive moisture inside the control panels and transducer wiring boxes.
- Check for corrosion and grease the moving parts if required to reduce corrosion.
- Check tension and wear of belts on blower and combustion fan.

Monthly

- Test critical inputs for proper shutdown capacity.
- Test the operation of the overloads.
- Test building sump switch if it is present.

Yearly

- Test each input.
- Test alarm conditions.

- Test the operation of each output device.
- Belts associated with blower and combustion fan shall be checked weekly. At a minimum, these belts will be replaced annually.

EVERY 0 OPERATING HOURS

Feed Oiler, Electric

1) Check oil level and top up if necessary.
2) Inspect the oiler to ensure it is running properly.

EVERY 200 OPERATING HOURS

Flow Meter, Pitot Tube

1) Check the pitot tube flow rates to ensure that the readings make sense.
2) Blow any water out of the air lines if required.
3) Remove the air lines from the transducer to ensure that transducer output is 4mA or zero CFM on the display. Recalibrate the zero set point if required.

Blower, Rotary Lobe, Sutorbilt

Check oil level and top off if necessary.

Note: DO NOT MIX OILS. Factory installs AEON PD synthetic oil. If you want to use mineral oil, oil should be drained and replaced. MLE stocks AEON oil.

If using Gun-Fil automatic grease fittings, check quantity of grease.

EVERY 500 OPERATING HOURS

Blower, Rotary Lobe, Sutobilt

Lubricate the drive end bearings through grease fittings. Use recommended grease only!

When regreasing, the old grease will be forced out of the vents. To prevent damage to seals, these vents must be opened at all times.

EVERY 800 OPERATING HOURS

Compressor, MI (Mink)

1) Check the level and condition of the synchronizing gear oil.
2) Clean (with pressurized air) or replace the inlet screen.

Pump, Discharge

Close-Coupled Unit
Ball bearings are located in and are part of the motor. They are permanently lubricated.
No greasing required.

Frame-Mounted Unis
Regrease frame with a #2 sodium or lithium based grease. Fill until grease comes out of relieve fittings, or lip seal.
Then wipe off excess. Follow motor and coupling manufacturers' lubrication instructions.

Note: Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

Feed Oiler, Gravity

1) Check oil level.
2) Top up if necessary.

Valve, Solenoid

1) Test the operation of the solenoid valves.
2) Check to ensure valve seals are closed.

Switch, Level

1) Test the operation of the switch.
2) Remove the switch and check for debris buildup that can potentially cause a failure of normal operation.

Tank

1) Check level in tank.
2) Inspect for leaks.

Vacuum Relief Valve

1) Pretest – Testing of the valve prior to disassembly to determine opening point, blowdown, and seat tightness.
2) Disassembly – Inspect parts to determine extent of required repairs.
3) Repairs – Cleaning, reconditioning, replacement, lapping, and minor machining of parts.
4) Assembly – assembly of the valve and valve components.

Vapor Liquid Separator

1) Check Check for sediment buildup.
2) Drain and flush out the tank.
3) Check for water leaks.
4) Clean each float with soapy water
5) Clean sight glass if needed

Vertical Level Switch (Almeg)

1) Test the operation of the switch.
2) Remove the switch and check for debris buildup that can potentially cause a failure of normal operation.

Yokagawa MW-100 Data Logger

1) Change data card each month

Filters

1) Check filter condition and change if needed: VLS filter, blower intake filter, combustion fan filter, air compressor air filter.

Poppet Valves

1) Conduct 9-minute poppet valve test to verify poppet valves are properly seating. Utilize high flow air sample pump to collect an air sample from vacuum port in tedlar bag at the poppet valve change, 20 seconds after poppet valve change, and two minutes later (approximately 2½ minutes after the poppet valve change). Conduct this sampling for three consecutive poppet valve changes.

Below Grade Vaults

At a minimum, inspect the underground vaults for accumulated rainwater. If rainwater is present and absent of sheen pump to nearby land surface. If rainwater is present and a sheen is identified containerize water and manage accordingly.

EVERY 1500 OPERATING HOURS

Blower, Rotary Lobe, Sutorbilt

If premium grade mineral oil is used, the oil should be drained, the gearbox flushed and the oil replaced every 1500 hours or more frequently if inspection so indicates. With AEON PD synthetic blower lubricant, perform the above oil change maintenance after 4500 to 7500 hours.

Note: DO NOT MIX OILS. See operating manual if changing oils.

EVERY 2000 OPERATING HOURS

Flow Meter, Pitot Tube

Recalibrate the zero set point if required. (See specification sheet for calibration of specific transducer).

Valve, Solenoid

Remove the top with the power off to the valve and clean any dirt out of the valve.

VLS Units

Clean interior of each VLS unit to removed accumulated sediments.

EVERY 4000 OPERATING HOURS

Blower, Rotary Lobe, Sutorbilt

If AEON PD synthetic blower lubricant is used, drain and replace according to manufacturers recommended procedure.

Note: DO NOT MIX OILS. See operating manual if changing oils.

Gauge, Pressure

1) Check accuracy of gauges.
2) Zero gauge if required.

Gauge, Temperature

1) Check accuracy of gauges.
2) Zero gauge if required.

Gauge, Vacuum

1) Check accuracy of gauges.
2) Zero gauge if required.

Gauge, Magnehelic

Verify the gauge's calibration with a sounder or other measuring device.

Valve, Solenoid

Check and clean the seals and replace with seal kit if necessary.

VAPOR LIQUID SEPARATOR MODULE

GENERAL

The vapors are drawn through a cyclone separator to remove water droplets from the air stream entering the vacuum blower or pump. Air exits the vapor liquid separator from the top center of the vessel. Water is collected in the bottom of the vessel and can be drained manually or drained automatically with a transfer pump if provided.

Vapor liquid separators have a clear site glass on the side of the separator vessel showing the level of fluid in the separator. A High/High level switch is provided to shut down the system if the liquid level in the tank trips the switch. The blower can be restarted when the liquid has been drained from the tank. If a liquid transfer pump is used to remove liquid from the tank three level switches are provided, the low and the high level switches control the pump, and the high/high to shut down the system. Some inlet separators can have a fourth switch as a Low/Low alarm to shut off the system if the low switch fails.

OPERATION

Before starting the transfer pump for the first time, the following operations and checks must be performed:

- Ensure the inlet and discharge valves are open.
- Prime the pump.
- Check the rotation of the motor.

To start up the pump the first time:

- Turn on the pump.
- Check the power draw on all three legs.
- Check the flow rate of water.
- Regulate the flow rate of water with the upstream gate valve. This flow should not exceed the capacity of the carbon filters if present.
- Check for water leakage around the pump and fittings.

Operating checks:

- Check the outlet pressures.
- Check the flow of water.
- Check the motor power consumption.
- Check the temperature of the service liquid.
- Check for leaks.

OPERATING SEQUENCE

DISCHARGE PUMP

Start Requirement:

- System must be started, and
- Vapor Liquid Separator (VLS) high level switch must be on, and
- VLS tank low level switch must be on, and
- Downstream module is ready to accept water.

Stop Requirement:

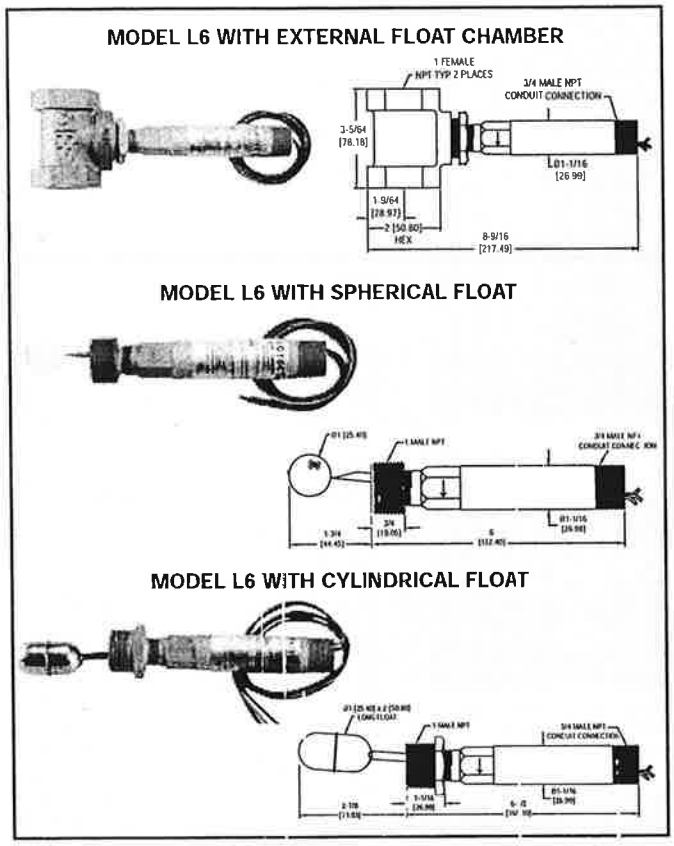
- System is turned off, or
- Discharge tank low level switch is off, or
- Downstream module is not ready to accept water.

VLS CLEANING PROCEDURE

- If the Tank is full, use pump to remove the majority of the liquid.
- Once tank in drained, open drain valve to remove the remaining liquid.
- Remove rubber cap and steel cover
- Use vacuum (i.e. Shop Vac®) to remove any settlement in the bottom of the tank.
- Inspect tank wall to see if all contaminates have been removed.
- Remove union to remove level column assembly.
- Inspect Level Switches and clean with light detergent.
    - **Note: Using acids to clean Level Switches will cause damage to the switch. Use only detergent to remove any contaminates.**
- Remove Sight Glass and Flow Valve assembly.
- Inspect flow valves for any contaminates and clean with light detergent.
- Check piping for flow valves for contaminates.
- Reinstall Sight Glass.
- Reinstall Level Switch assembly.
- Reinstall steel plate and rubber cap.
- Start filling tank and make sure all connections are not leaking.
- Test Level Switch alarms.

Series L6 FLOTECT® Liquid Level Switch

Easy In-wall or External Installation, Up to 2000 psig (138 bar)



SPECIFICATIONS

Service: Liquids compatible with wetted materials.

Wetted Materials:

Float: Solid polypropylene or 304 SS.

Lower Body: Brass or 303 SS.

Magnet: Ceramic.

External Float Chamber (Tee): Matches lower body choice of brass or 303 SS.

Other: Lever Arm, Spring, Pin, etc.: 301 SS.

Temperature Limit: -4 to 220°F (-20 to 105°C) Standard, MT high temperature option 400°F (205°C)(MT not UL, CSA or ATEX). ATEX compliant AT option ambient temperature: -4 to 167°F (-20 to 75°C) process temperature: -4 to 220°F (-20 to 105°C).

Pressure Limits: See chart below.

Enclosure Rating: Weatherproof and Explosion-proof. Listed with UL and CSA for Class I, Groups A, B, C and D; Class II, Groups E, F, and G. (Group A on stainless steel body models only).ATEX CE 0344 Ex II 2 G EEx d IIC T6 Process Temp≤75°C. EC-Type Certificate No.: KEMA 04ATEX2128

Switch Type: SPDT snap switch standard. DPDT snap switch optional.

Electrical Rating: UL models: 5A @ 125/250 VAC (V~). CSA and ATEX models: 5A @ 125/250 VAC (V~); 5A res., 3A ind. @ 30 VDC (V⎓). MV option: .1A @ 125 VAC (V~). MT option: 5A @125/250 VAC (V~). [MT option not UL, CSA or ATEX].

Electrical Connections: UL models: 18 AWG, 18" (460 mm) long. CSA and ATEX models: terminal block.

Upper Body: Brass or 303 SS.

Conduit Connection: 3/4" male NPT standard, 3/4" female NPT on junction box models.

Process Connection: 1" male NPT on models without external float chamber, 1" female NPT on models with external float chamber.

Mounting Orientation: Horizontal with index arrow pointing down.

Weight: Approximately 1 lb (.5 kg) without external float chamber, 1.75 lb (.8 kg) with external float chamber.

Specific Gravity: See chart below.

Agency Approvals: UL, CSA, CE and ATEX.

Model No.	Body	Installation	Float Material	Max. Pressure psig (bar)	Min. Sp. Gr.
L6EPB-B-S-3-O	Brass	Side Wall Mounting	Polypropylene Spherical	1000 (69)	0.9
L6EPB-B-S-3-A	Brass	Side Wall Mounting	304 SS Cylindrical	200 (13.8)	0.5
L6EPB-B-S-3-C	Brass	Side Wall Mounting	304 SS Spherical	350 (24.1)	0.7
L6EPB-B-S-3-B	Brass	Brass External Float Chamber (Tee)	Polypropylene Spherical	250 (17.2)	0.9
L6EPB-B-S-3-H	Brass	Brass External Float Chamber (Tee)	304 SS Spherical	250 (17.2)	0.7
L6EPB-S-S-3-O	303 SS	Side Wall Mounting	Polypropylene Spherical	2000 (138)	0.9
L6EPB-S-S-3-A	303 SS	Side Wall Mounting	304 SS Cylindrical	200 (13.8)	0.5
L6EPB-S-S-3-C	303 SS	Side Wall Mounting	304 SS Spherical	350 (24.1)	0.7
L6EPB-S-S-3-S	303 SS	304 SS External Float Chamber (Tee)	Polypropylene Spherical	2000 (138)	0.9
L6EPB-S-S-3-L	303 SS	304 SS External Float Chamber (Tee)	304 SS Spherical	350 (24.1)	0.7

Surprisingly compact, the Series L6 Flotect® Level switch is designed and built for years of trouble-free service in a wide variety of process liquid level applications. Operation is simple and dependable with no mechanical linkage as the level switch is magnetically actuated. The float lever pivoted within the body moves when the process liquid displaces the float. A magnet on the opposite end of the float lever controls a second magnet on the switch actuating lever located in the switch housing.

FEATURES

- Leak proof lower body machined from bar stock
- Choice of models for direct side wall mounting or mounted in a tee to act as an external float chamber
- Weatherproof
- Explosion-proof (listings included in specifications)
- Electrical assembly can be easily replaced without removing the unit from the installation so that the process does not have to be shut down
- Sensitive to level changes of less than 1/2" (12 mm)

Options:

Gold Plated Contacts option for dry circuits,add suffix **-MV** (see electrical rating in specifications)

High Temperature option rated 400°F (204°C), add suffix **-MT** (see electrical rating in specifications, no listings or approvals, only available on models with stainless steel floats)

CSA and UL approved construction, includes weatherproof and explosion-proof junction box, add suffix **-CSA**

ATEX approved construction includes, weatherproof and explosion-proof, junction box, add suffix **-AT**

DPDT contacts, change seventh character in model number to "D". Example: L6EPB-B-D-3-O

303 Stainless Steel Upper Body, change fifth character in model number to "S". Example: L6EPS-S-S-3-S

Options Not Shown: 1-1/2" and 2" male NPT process connection, 2" female NPT connection tee, and top mount.

4.2 V-Belts & Sheaves

With proper installation and maintenance, V-belts will have a longer, more cost-effective service life. Main guidelines on how to correctly install a V-belt drive will now be discussed.

4.2.1 Mounting Structure

Drive tensioning can impose excessive load on the structure that supports the motor, reducer, and other driven equipment. For example, a 100-hp drive that runs a 1,760-rpm motor, the force induced by belt tension can easily exceed 2,500 lb. It's important therefore to design the mounting structure in an appropriate manner to support this load without deflection under static and dynamic load conditions. Otherwise, all of the care taken during installation would be futile.

4.2.2 Center Distance Adjustment

V-belt drive units should allow for an adjustment of the distance between the driving and the driven sheaves. The center distance must have a minus allowance to permit easy installation of the V-belts in order to avoid any strain or damage and a plus allowance to allow for an adjustment to the desired tension. In most cases, the minus allowance is 1.5% of the center distance and the plus allowance is 3%.

Motor base or motor slide rails are the most common adjustable mechanisms for tensioning a drive. These devices are available in a variety of models, including spring-loaded versions that automatically compensate for belt elongation. For installations that do not allow for an adjustable center distance, the use of an idler pulley is recommended.

Example 4.1

If the center to center distance of a drive belt system is 40 in., calculate the allowance required for installation and removal of the belt drive.

Answer:

The minus allowance = 40[in] x 1.5% = 40 x 0.05 = 2 in.

The plus allowance = 40[in] x 3.0% = 40 x 0.03 = 1.2 in.

The maximum value of the center to center distance should therefore be at least 42 in. and the minimum distance should be equal to or less than 38.8 in.

4.2.3 V-Belt Installation

Step 1 : Replacing V-belts

- Reduce the center-to-center distance between the driver and the driven sheaves by moving the motor-plate inwards. This reduces tension and allows for slack in the belt between the sheaves.

- Remove the used belts from the sheaves and examine the groove surfaces for any damage.

Step 2: Sheave Inspection

- Check for wear on the side walls, cracking, reinforcing nylon cords and oily surfaces.

- The wear of the V-groove in the sheave can be measured with a "go-no-go" belt gauge available from Baldor•Maska Part No. 006346.

It's very important to know if the V-groove walls have been subjected to excessive strain caused by improper belt tension or misalignment between the driving and the driven sheaves. If the V-groove surface has deteriorated or been damaged, the defective parts must be replaced with new ones. Worn sheaves can reduce belt life by as much as 50%.

Step 3: Cleaning Sheaves

- Use a stiff brush to remove all foreign matter from the sheave that could abrade belts. Do not use brushes that could scratch the surface of the groove walls as these scratches can graze the V-belt's outer skin when rotating, thus systematically destroying it.

- Pulley grooves should be free from rust, oil, grease, dust and burrs.

Step 4: Sheave Alignment

Simple alignment for angular and parallel offset

The question of alignment is not as critical in V-belts drives as with other systems, for example they are inherently more forgiving of misalignment than synchronous belt drives. Nonetheless, before installing V-belts, verify that the sheaves are properly aligned and parallel as a prerequisite to proper tensioning. Poor alignment renders accurate tensioning impossible and causes a load imbalance across the belt span.

The first step consists of verifying whether the drive shafts are parallel, and the sheaves are in the proper position on the axis. This procedure can by checked with sufficient accuracy through use of a machinist's straightedge ruler, or by placing a tightly drawn piece of string, across the faces of the sheaves to see if all four points of contact are made.

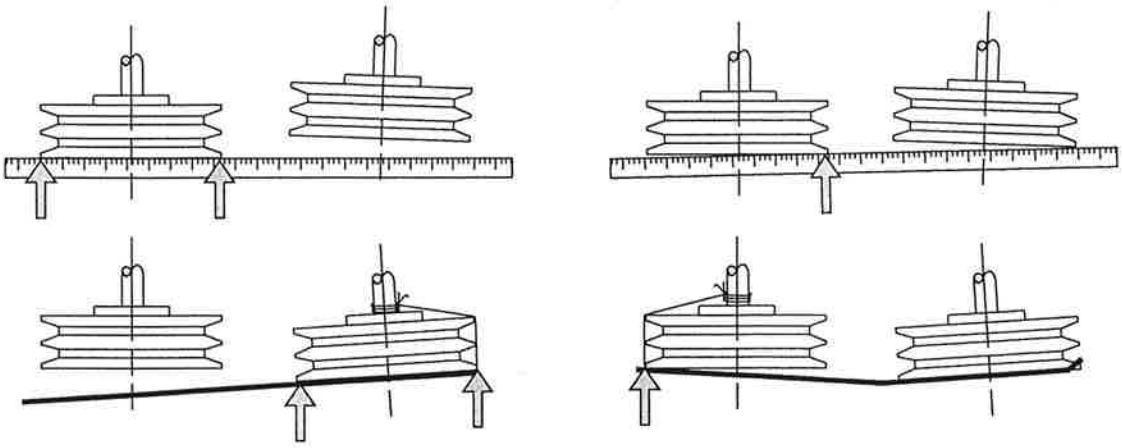


Fig. 4.1: Alignment – Use of a straightedge or a string

However, if there is a difference in the side wall thickness of the sheaves, this method will not be sufficiently accurate. For this reason, this method will be effective only when the sheaves are a matched pair. When this is not the case, the sheaves must be aligned parallel by their grooves. This is the preferred alignment method with any drive.

In order to determine what degree of misalignment is acceptable, and at what point it becomes excessive, alignment must be quantified and compared to the belt manufacturer's recommendations for various drives. An example of this follows:

Maximum allowable offset

Type	V-belt	Synchronous belt
Angular offset (deg.)	**0.5**	**0.25**

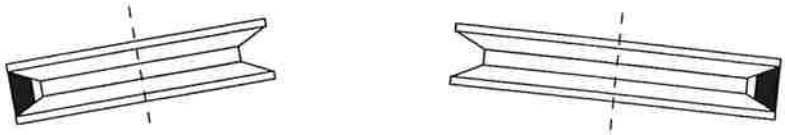


Fig. 4.2: Angular offset

Type	V-belt	Synchronous belt
Parallel offset (in. / ft. of center distance.)	0.1	0.05

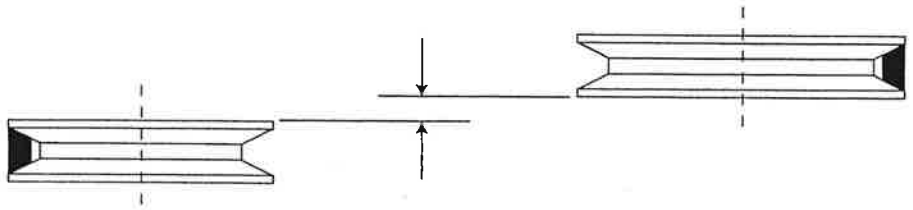


Fig. 4.3: Parallel offset

Example 4.2 With a 5 ft. center distance, what is the allowable parallel offset for a V-belt drive?
Answer:
V-belt parallel offset = 5 x 0.1 = 0.5 in. max

Other types of misalignment

The preceding procedure illustrated a quick method for checking sheave alignment as seen from one angle only. This method is useful only when the engine shafts are parallel horizontally in a straight line as seen in Fig. 4.1. In fact, sheaves that have been installed on a shaft can be misaligned if the driven shaft does not have the same angle as the driver shaft (for example, dips towards the ground) as opposed to the horizontal surface (Fig. 4.4). In this case, the two shafts would have to be placed parallel to each other at this plane. To verify, you would have to look from another angle and repeat the steps for checking misalignment with a level gauge. This type of misalignment should not be confused with a 1/4th or 1/8th turn drive design.

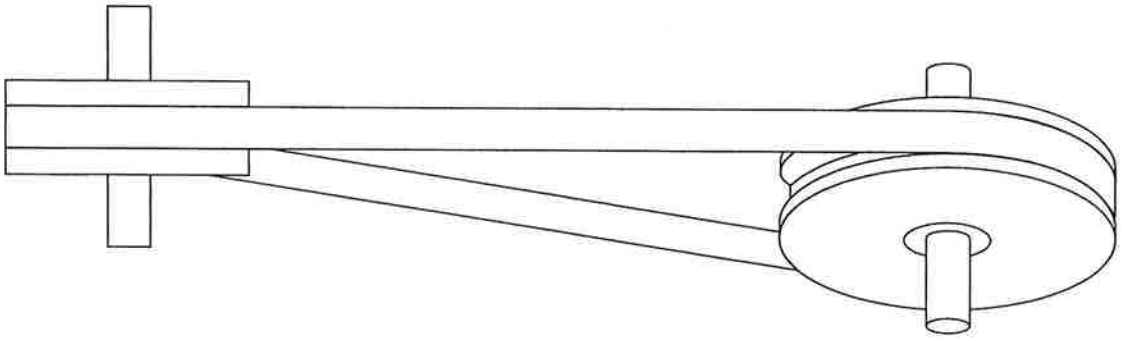


Fig. 4.4: Other type of misalignment

Step 5: V-Belt Installation

- Verify that the replacement belts are of the corresponding size. The V-belt cross-section must be compatible with the V section in the groove.

As discussed in chapter 2, V-belts are made of different materials and of varied design depending on the application. In addition, similar cross-section belts from different manufacturers do not necessarily have the same features and can differ in stretch capacity and friction coefficients. For this reason, belts from the same manufacturer should be used with multiple groove sheaves.

Never use new and used V-belts on the same design, even if the used belts seem to be in good shape. Belts should always be installed in matched sets. If one belt needs to be changed, the whole set should be replaced. If the V-belts are not of the exact same length, it will result in rapid wear of the new belts and unequal distribution of the load, thus reducing belt life significantly.

- Adjust the center-to-center distance in order to slide the belts over the sheaves. The motor must shift enough to allow the belts to be removed or installed without forcing them.

- Never lever belts over the sheave grooves as this may injure the reinforcements cords.

- Install the new belts over the sheaves so that the slack side of all belts is on the same side, either the top or the bottom of the drive.
- Increase the drive center distance to pre-tension the belts (see next section for correct tensioning).

4.2.4 Tensioning

One of the most important factors that determines the efficiency of a V-belt drive is proper belt tensioning. Insufficient belt tension will cause belt slippage, resulting in reduced pulling capacity. To increase tension, as seen earlier, we have merely to increase the center distance. However, before attempting to tension any drive, it is imperative that the sheaves be properly installed and aligned as stated in a preceding section (section 4.2.2).

The effects of low tension on a synchronous belt are equally disastrous. Low tension allows the belt teeth to ride up on the sprocket teeth, thus placing severe stress on the teeth. Under heavy loads, the drive can jump teeth (ratchet), which leads to rapid belt failure.

If too much tension is applied to the V-belts, the service life of belts and bearings will be considerably reduced. Drive tension that is too high can have other, far-reaching consequences. Undue stress is placed not only on the belt, but the bearings and shafting as well. Early belt failure is the norm, as excessive tension over-stresses belt cords. Bearing overload also leads to early failure, and can result in motor and reducer damage.

- **Incorrect tension can destroy belts and equipment.**
- **Alignment affects belt tension.**
- **Tension can be measured with a simple spring scale or acoustical instrument.**

4.2.4.1 Measuring Techniques

V-belts and synchronous belts have been greatly improved compared to only a few years ago. They deliver a lot more power in a smaller package. In order to benefit from this improvement, it is essential that they be correctly aligned and tensioned. All it takes is a few simple tools and techniques to easily and accurately tension a drive, in order to yield the high performance designed into them.

Deflection Force Method

The most common method for tensioning adjustment is with a tension meter or another type of spring scale tool. This tool measures the deflection force when pressed to the open span of the belt drive. Carrying out the following procedures will obtain adequate tensioning for most V-belt drive requirements:

Step 1: Following the belt installation procedure already discussed, arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug (Fig. 4.5).

Step 2: Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under the highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If this is the case, stop the drive and tighten the belts until all the slack is taken up. Further increase the tension until only a slight bow on the slack side is apparent while the drive is operating under load.

Step 3: Stop the drive and use the meter to measure the force necessary to depress one of the center belts 1/64-inch for every inch of belt span. For example a deflection for a 50 inch belt span is 50/64 or 25/32-inch. If the deflection exceeds 50/64 in. for every inch of span length, the drive needs to be tensioned higher. If the deflection is less, drive tension is excessive and should be reduced.

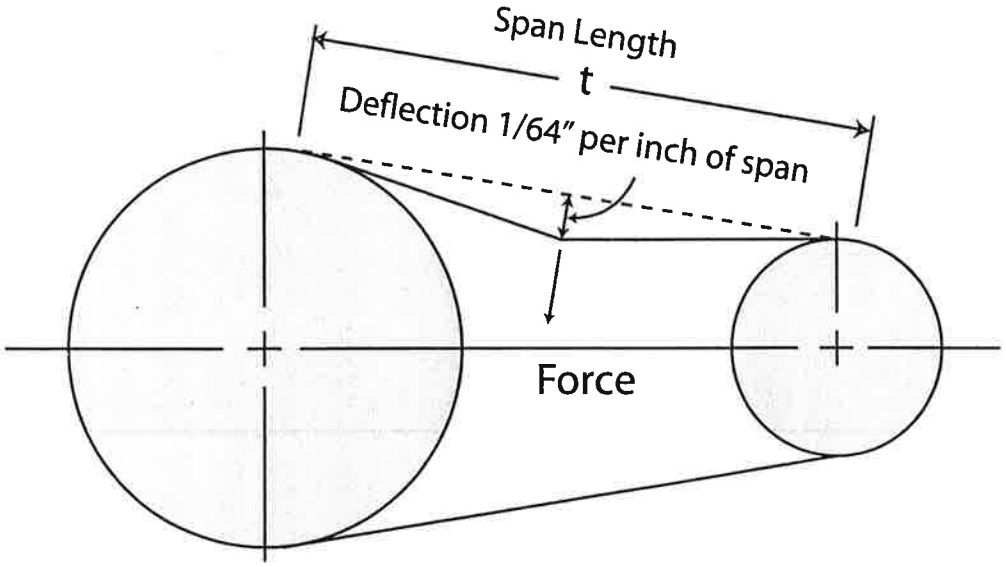


Fig. 4.5: Belt Tension – Deflection force method

$$t = \sqrt{C2 - \left(\frac{D_1 - D_2}{2}\right)}$$

The amount of force required to deflect the belt should match up with the deflection force data noted in the chart below. Note that the deflection force varies with V-belts from the initial run-in values, which are higher (reflecting higher run-in tensioning) than the normal values obtained after the run-in period.

Standard V-belt Tensioning Deflection Force Table For Baldor•Maska Blue Flex Belts

Belt Cross-Section	Smaller Pulley Diameter Range (in.)	Deflection Force	
		Run-in (lbs)	Normal (lbs)
A	3.0 - 3.6 3.8 - 4.8 5.0 - 7.0	3 - 3/8 4 - 1/4 5-1/8	2 - 1/4 2 - 7/8 3 - 3/8
AX	3.0 - 3.6 3.8 - 4.8 5.0 - 7.0	4 - 1/8 5 6	2 - 3/4 3 - 1/4 4
B	3.4 - 4.2 4.4 - 5.2 5.4 - 9.4	4 6 7 - 1/8	2 - 5/8 4 5 - 1/4
BX	3.4 - 4.2 4.4 - 5.2 5.4 - 9.4	5 - 1/4 7 - 1/8 9	3 - 1/2 4 - 3/4 6
C	7.0 - 9.0 9.5 - 16.0	11 - 1/4 15 - 3/4	7 - 1/2 10 - 1/2
CX	7.0 - 9.0 9.5 -16.0	13 - 1/2 17 - 1/2	9 11 - 3/4

D	12.0 - 16.0 18.0 - 22.0	24 – ½ 33	16 - 1/2 22
E	21.6 - 27.0	48	32
3V	3.40 - 4.20 4.20 - 10.6	6 7	4 5
3VX	2.20 - 3.65 4.12 - 10.6	7 8	5 6
5V	7.10 - 10.9 11.8 - 16.0	16 20	8 - 12 10 - 15
5VX	4.40 - 10.9 11.8 - 16.0	18 22	10 - 14 12 - 18
8V	12.5 - 17.0 18.0 - 22.4	36 40	18 - 27 20 - 30

Step 4: Restart the unit and allow the belts to seat themselves in the sheave grooves.

Step 5: Stop the unit after a few hours and measure all belt tensions (Refer to Step 3). Note: During the initial run-in period, it can be expected that the belt tension will need to be re-adjusted before obtaining the correct deflection. Repeat the procedure until all of the slack is taken out of the belts.

Step 6: Restart the unit. Steps 4 and 5 are often overlooked during belt installation, but re-checking the tension is a very important step in the efficient operation and maintenance of V-belts. As such, it is worth taking a little extra time to do so, as you will see in the next step.

Step 7: See section 4.2.4.2 on Run-in period

Elongation method

Belt tension can be measured by marking lines 10 inches apart across the belts' top surfaces at 90 degrees to the length on an installed belt. Apply tension until the gap increases by the desired percentage. For 2 per cent tension, the lines on the tensioned belt would be 10.2 inches apart. Mechanical failure may result when belt tensioning is excessive; 2 to 2.5 per cent elongation should be regarded as the limit. This procedure is normally used to tension drives using banded belts that require a deflection force beyond the range of conventional equipment. The elongation method is not suitable for tensioning synchronous belts that are constructed with fiberglass or aramide cords that have almost no elasticity. This method is accurate only when using long belts; the deflection method discussed above is the standard, recommended procedure to follow.

4.2.4.2 Run-in Period

The first 48-hours following installation is the most critical time for V-belt tension verification. The initial stretch is taken out of the belt during this run-in period, and it settles deeper into the groove of the sheave after the soft rubber surface of the belt's outer envelope is abraded away causing the belt to run slack. To avoid considerable slippage, frictional burning, and other irreparable damage the slack on the new belts must be taken up.

It is very important to verify the tension on a new drive frequently over the first few days by observing the slack side. Adjust the belt according to the normal tension data given in the chart until all signs of stretching have been eliminated. This process must be repeated until all of the stretch has been eliminated. After operating for several days, the belts will seat themselves in the sheave grooves and it may be necessary to readjust the tension so that the drive shows a slight bow on the slack side. Being vigilant at this stage will eliminate early damage and promote longer belt life. It will also improve the mechanical efficiency of the motor, and the driven mechanical equipment, by reducing wear on rotating mechanical components.

4.2.5 Idler Pulleys

The preferred location for an idler pulley is always on the slack side of the drive (Fig. 4.6). An inside idler imposes less stress on the belt, and should be located near the larger sheave to minimize the reduction in the arc of contact with the smaller sheave or sprocket. If an outside idler is the only option, locate it near the smaller sheave as this enhances the arc of contact with the smaller sheave. It is important that the idler diameter is not inferior to the smallest sheave in the drive.

- An inside idler decreases the arc of contact on adjacent wheels.
- An outside idler increases the arc of contact on adjacent wheels.

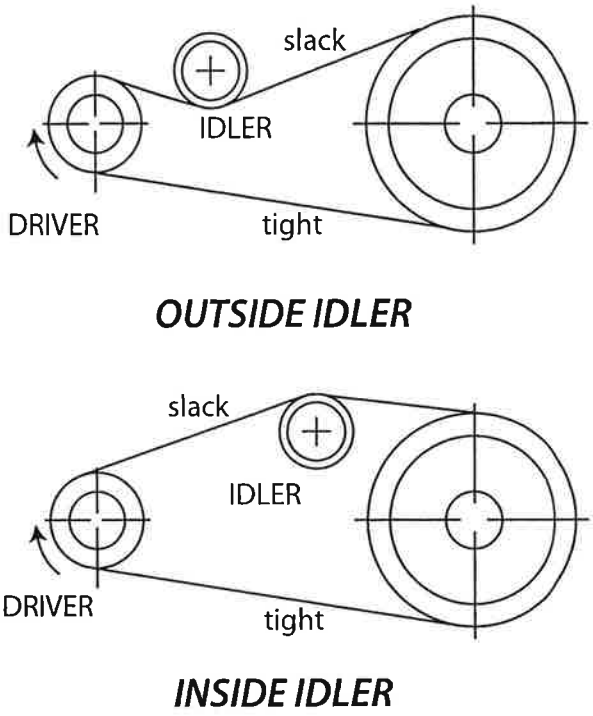


Fig. 4.6: Idler – Recommended position

Idlers are occasionally used in the design of conventior al V-belt and timing belt drives for various reasons:

1. To provide take-up for fixed center drives.
2. To clear obstructions.
3. To subdue belt whip on long center distance.
4. To maintain tension.
5. To improve a poor design, such as a very small sheave driving a very large sheave.

If at all possible, the use of idlers should be avoided. They either reduce the horsepower rating or shorten belt life. However, as stated earlier, idlers should be located, if at all possible, on the slack side of the drive. This is especially true when spring loaded or weighted idlers are being used, as this keeps the spring force or the weight to a minimum.

4.2.6 Maintenance

Make V-belt drive inspections periodically.

- Check belt tension regularly.
- Never apply belt dressing, as this will damage the belt and cause early failure. They often have a solvent effect upon rubber compounds, which may temporarily increase friction, but does so at the expense of rapid V-belt deterioration.
- V-belts should be kept clean and free of oil, grease and dust.
- For outdoor machinery, avoid exposing belts to direct sunlight.
- Factors affecting ultimate belt life include temperature (an increase in temperature of 10°C or 18°F can cut longevity by 50%), the power pulse characteristics of the engine, abrasives and chemical contamination, abnormally tight or loose tensioning, worn pulleys, and misalignment.
- High temperatures are harmful to long V-belt performance. For this reason, avoid tight fitting mounting and safety guards that may obstruct the ventilation openings.

The essential factors to watch for when using belts are: keeping them clean, any significant changes in temperature, the humidity level, and the presence of chemical products or fumes. The degree to which these elements are present directly affects belt life and performance. Many applications require belts with a resistant substance or fabric casing as a protection against acids and solvents.

4.2.7 Belt Storage

Storage conditions have a direct influence on V-belt life. Inadequate storage may cause damage to belts and thus reduce belt life.

- Storing belts on sheaves saves space and is the best way of storing. Shorter belts may be stacked in single file one on top of the other, while long belts should be folded 3 or 5 times.
- V-belts should be stored without stress i.e. without tension, pressure or any other form of deformation.
- Damp storage rooms are unsuitable. This leads to mildew formation which deteriorates the belt's jacket.

V-belts should be stored in a cool and dry place with temperatures varying from 10° to 20° C. A relative humidity of between 20% - 60% offers the best storage conditions as humidity may cause a fungus to form on belts. They should also be kept away from direct sunlight or arc welders and high voltage apparatus.

4.3 Typical Problems

4.3.1 Drive Misalignment

Belt drive misalignment is one of the most common causes of premature belt failure. It reduces belt drive performance and causes uneven wear to one side of the belt. A belt can be damaged in as little as one hour, to a couple of days, if the sheaves or pulleys have been improperly aligned during installation.

All drive components should be checked to verify that they are all well-tightened and in place. If the misalignment comes from design, the unit should be revised in order to eliminate the problem. Misalignment may force a belt to roll over in the sheave, or it can throw the entire load onto one side of the belt, thus stretching or breaking the cords.

Angular misalignment (Fig. 4.1) results in accelerated belt/sheave wear and potential stability problems in single groove V-belt drives. If the same problem occurs with a multiple groove pulley, unequal load sharing results to each belt and leads to premature failure.

4.3.2 Sheave Cracked in Hub

When mounting a bushing by tightening the screws, excessive torque can crack the sheave as a result of too much pressure against the hub. Never allow the sheave to be drawn into contact with the flange of the bushing, and never lubricate the bushing or the sheave (lubrication can increase the lateral forces up to seven times with the same torque values on cap screws).

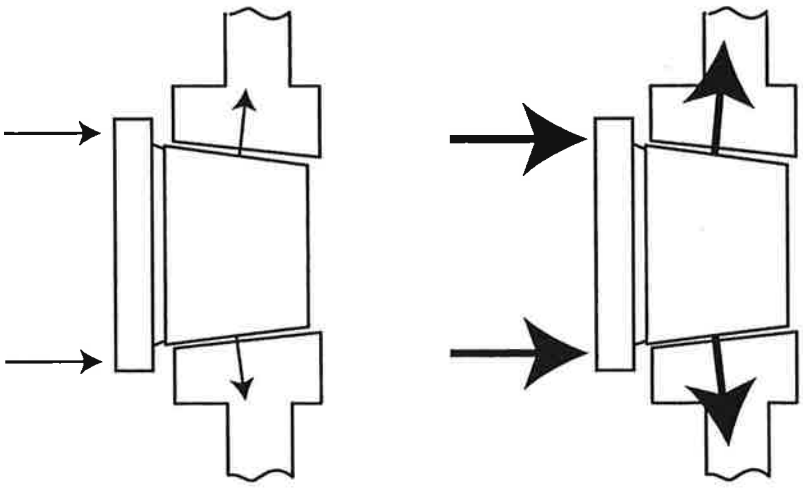


Fig. 4.7: Excessive torque - High pressure against the hub

4.3.3 Vibrations

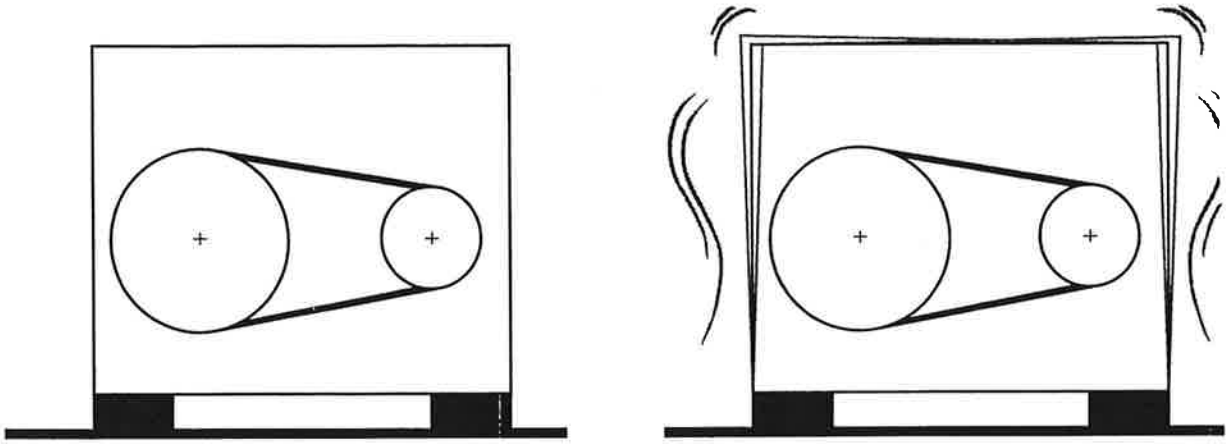


Fig. 4.8: High level of vibration

Vibrations are the most serious problem that can develop with a drive design. There are two reasons as to why this is such a difficult problem: First of all, the cause of the problem is very tricky to discover, as all of the mechanism' components could be the source of the vibrations. Secondly, vibrations involve the entire drive design; the problem is thus not limited to the sheave or belt, which are easily replaced.

Step One involves finding the main source of vibrations – is the entire design out of balance? Is the design inaccurate as far as the choice of components is concerned? Has there occurred a mechanical breaking of a part, etc.? The second step is to apply the required corrections. However, if the designer has to deal with a high level of vibration, then the use of specialized components should be considered (rolling joint, coupling, etc.).

4.3.4 Over Tension

Over belt tension results in accelerated wear of the shaft bearings. The solution is to reduce the center distance to lower the tension, as discussed in Section 4.2.4.

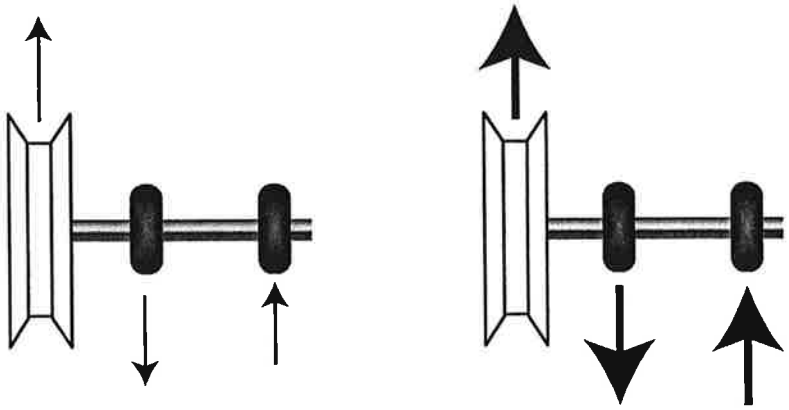


Fig. 4.9: High tension – Overloaded bearings

4.3.5 High Ratio with Short Center to Center Distance

In order to increase the arc of contact on a drive designed with a high ratio, it will be necessary to install an idler pulley. This tensioning device, as mentioned, should be installed on the slack side.

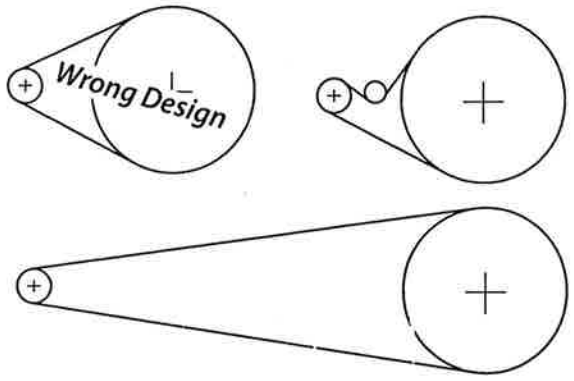


Fig. 4.10: Increase the arc of contact

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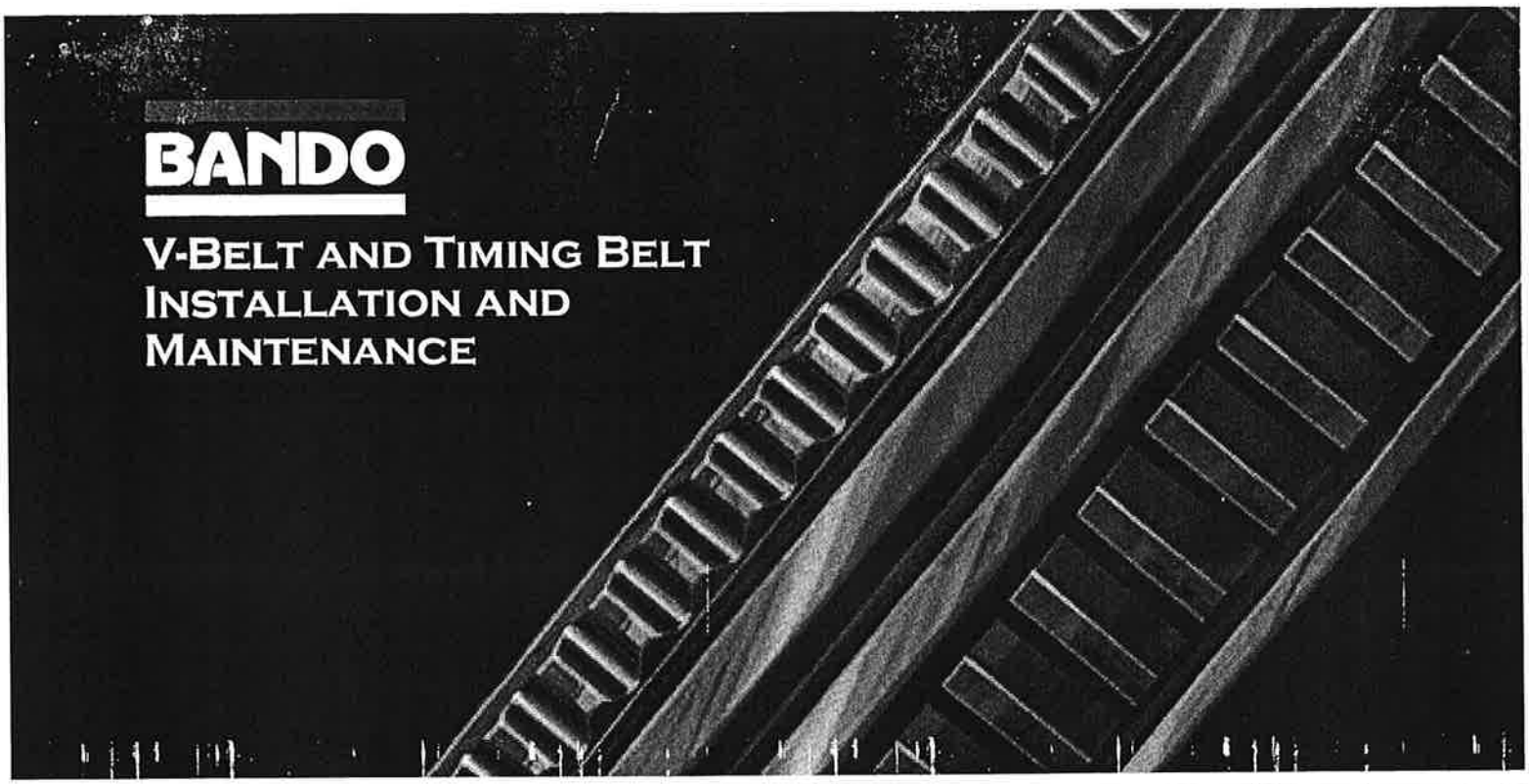
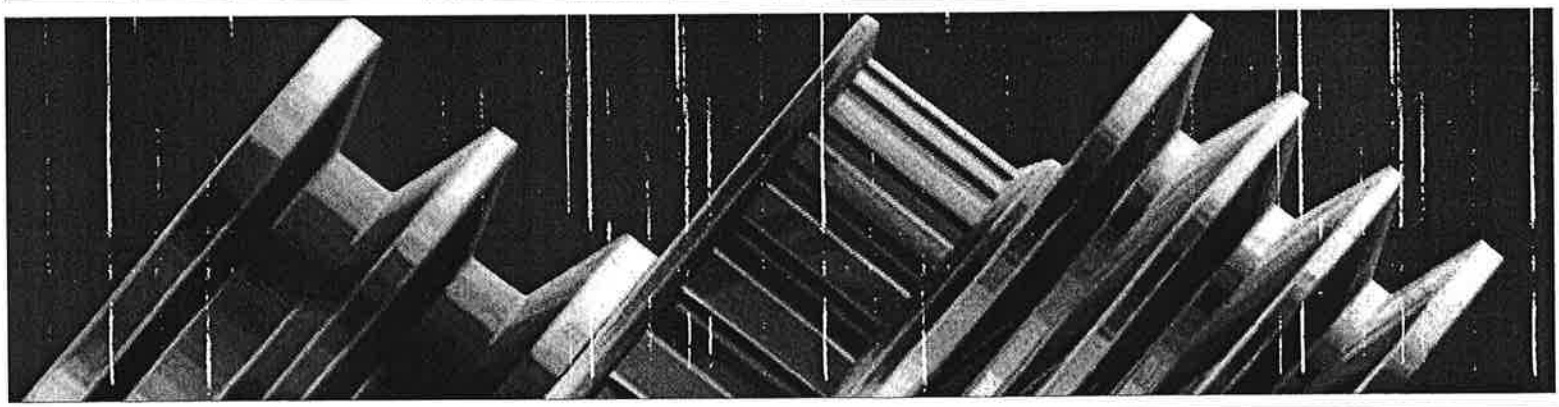
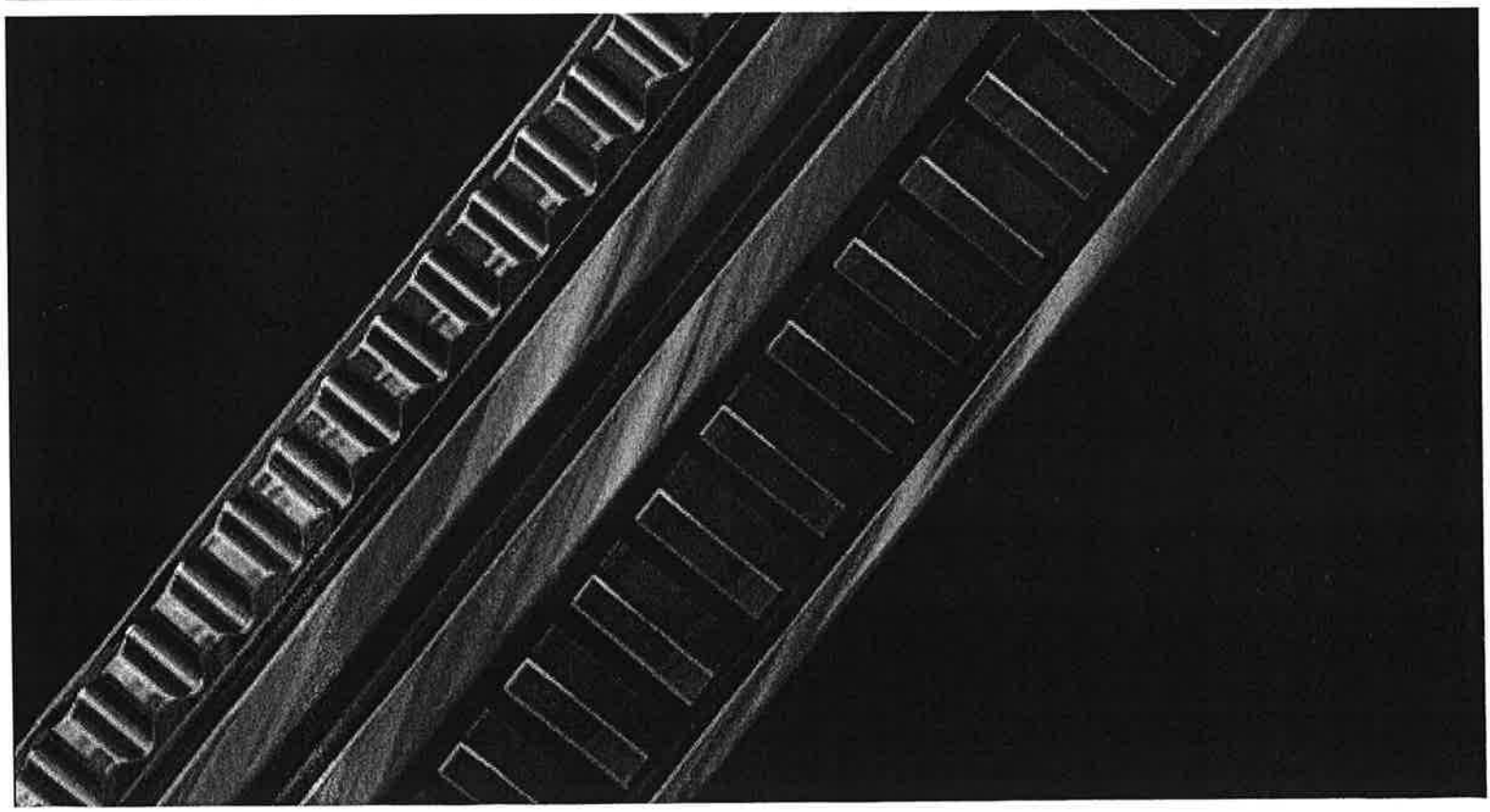
V-Belt and Timing Belt Installation and Maintenance







Introduction

The purpose of this manual is simple: to help you get maximum value from your belt drives. As you review this information, you'll understand why belts are industry's most widely used means of power transmission. They are easy to select, simple to install, and will give you years of efficient, trouble-free service.

Properly designed and installed belts are virtually maintenance-free; an occasional retensioning is all that's needed to keep them running smoothly. Because belt drives require so little attention, it's worth your time to follow the "common sense" guidelines in this manual. The payoff is maximum belt and sheave life, increased uptime, and efficient, uninterrupted equipment service.

10 Point V-Belt Installation Check List

- ☐ 1. Turn equipment OFF and lock out power source.
- ☐ 2. Shorten center distance and remove old belts.
- ☐ 3. Inspect and service take-up rails, bearings, and shafts.
- ☐ 4. Inspect and clean sheaves; replace worn and damaged sheaves.
- ☐ 5. Check and correct sheave alignment.
- ☐ 6. Select replacement belts.
- ☐ 7. Lay belts over sheaves; rotate until belts' slack is on the same side.
- ☐ 8. Check final sheave alignment.
- ☐ 9. Increase center distance until belts won't slip under a full load.
- ☐ 10. Inspect belt drive in 24-48 hours.

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V-Belt Installation

Caution: Before doing any inspection or maintenance on belt drives, turn the equipment off and lock out the power source.

Remove old belts

Remove the drive guard, loosen the take-up, and shorten the center distance between sheaves. This way, the old belts can be removed easily and the new belts can be installed without damage.

Inspect and service drive elements

Remove rust and dirt from take-up rails, and lubricate as necessary. Inspect and replace damaged machine elements such as worn bearings and bent shafts. Check bearings for oil.

Inspect and clean sheaves; replace worn or damaged sheaves

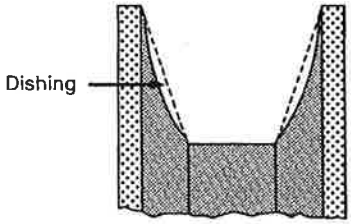
Worn sheave grooves are one of the principal causes of premature belt failure. Get your money's worth from a new set of belts by inspecting the sheaves carefully!

- Clean dirty, dusty, or rusty sheaves. They will impair the drive's efficiency and wear out the belt cover.

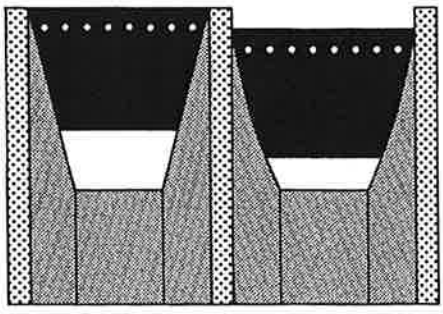
  Feel sheave grooves (wear gloves or use a rag) for nicks or burrs, and file them smooth.

- Belts should ride in sheave grooves so that the top of the belt is just above the highest point of the sheave. If the grooves are worn to the point where the belt bottoms out (a clue: check for shiny groove bottoms), the belts will slip and burn.

- If the groove walls are "dished out," the bottom corners of the belt will quickly wear off and cause rapid failure. Check groove wear by sight, touch, or with a Bando sheave gauge. If grooves are "dished out" 1/32" or more — replace the sheaves!



"Dishing" of groove sidewalls shortens belt life



Belt should ride like this

Low riding belts indicate worn grooves

Sheave installation and removal

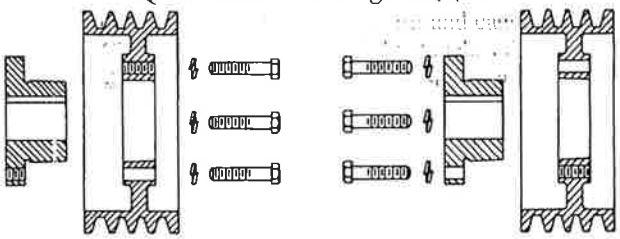
To install QD® sheaves:

The conventional mounting position for QD sheaves is with the bushing flange located toward the bearing. The reverse mounting position (for QD bushing sizes JA through J) is with the flange of the bushing toward the open end of the shaft. For either position:

1. Make sure the sheave bore and the tapered cone surface of the bushing are clean and free from paint, dirt, and lubricants. *Do not use lubricants to install QD sheaves.* Loosely assemble the bushing in the sheave, and insert the cap screws finger tight.
2. Slip the loosely assembled unit onto the shaft and position it for proper belt alignment.
3. Tighten down the hollow head setscrews in the flange on the key, snug enough to keep it in the desired position on the shaft.
4. Tighten the cap screws alternately and progressively to about half the recommended torque values in the table below. Check alignment and sheave runout (wobble) and correct as necessary. Continue to tighten the cap screws alternately and progressively to the torque values shown. To increase leverage, use a wrench or length of pipe.
5. Tighten the setscrew on the key to hold it securely in place during operation.

NOTE: Don't allow the sheave to be drawn in contact with the bushing flange. There should be a 1/8" to 1/4" gap when properly mounted.

QD Sheave Mounting Positions



Torque Values for Tightening QD Bushings

QD Bushing	Wrench Torque (In. Lbs.)	QD Bushing	Wrench Torque (In. Lbs.)
JA	60	E	720
SH	108	F	900
SDS	108	J	1620
SD	108	M	2700
SK	180	N	3600
SF	360	P	5400

To remove:

1. Loosen and remove all mounting cap screws. Insert two or three of the cap screws in the tapped removal holes in the sheave. Start with the screw opposite the bushing saw slot and progressively and alternately tighten each screw until the cone grip is broken between the sheave and the bushing.
2. Remove the sheave and bushing from the shaft. If the bushing won't slip off the shaft, wedge a screwdriver blade in the saw slot to loosen.

QD® is a registered trademark of Emerson Electric.

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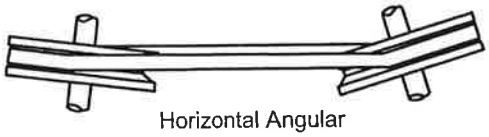
Check and correct sheave alignment

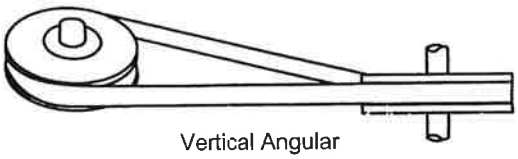
Misaligned sheaves will accelerate wear of belt sidewalls, which will shorten both belt and sheave life. Misalignment can also cause belts to roll over in the sheave, or throw all the load to one side of the belt – breaking or stretching the tensile cord.

Check for the types of sheave and shaft misalignment shown below. Correct alignment by placing a steel straightedge across the sheave faces so it touches all four points of contact.

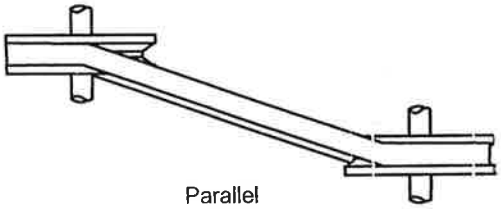
Types of sheave and shaft misalignment



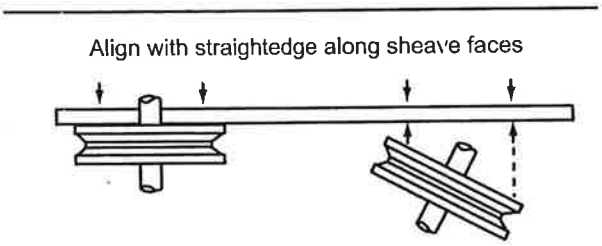
Horizontal Angular



Vertical Angular



Parallel



Select replacement belts

• Don't mix used and new belts on a drive

Used belts will ride lower in the sheave groove due to sidewall wear and normal stretch. New belts will ride higher in the sheave, travel faster, and operate at higher tension. Running used and new belts together will overload and damage the new belts.

Used belts may be used elsewhere on a light duty drive, or for emergencies.

• Don't mix belts from different manufacturers

Because dimensions and constructions vary among manufacturers, running such "mismatched belts" won't give full service life.

• Use matched sets

A matched set of belts is necessary to assure equal distribution of the load. With some manufacturers, length codes are necessary to match belts within a given size. Observe proper guidelines if your belts have match numbers.

Bando's *BAN/SET*™ process eliminates the need for match numbers — all belts of a given size will match with all others of that size. This system simplifies ordering, reduces inventory, and assures you'll have a matched sets of belts on hand.

• Use correct type and cross section belt

Match the correct belt cross section to the corresponding sheave groove — A to A, 3V to 3V, etc. Don't use a B section belt in a 5V sheave, or vice versa.

Don't replace A or B section belts with 4L or 5L fractional horsepower (FHP) belts. The dimensions are similar, but FHP belts can't handle the horsepower requirements of a heavy duty application.

Use Bando Combo™ belts when vibration and shock loads cause belts to turn over or jump out of the sheave grooves.

Install new belts and adjust the slack

Always shorten the center distance of the drive until the belts can be laid over the sheaves. *Never* pry or force a belt on the drive with a pry bar or by cranking. This will almost certainly damage the tensile cord and although the injury may not be visible, belt life will be drastically reduced.

Work the belts by hand to move slack so it is on the same side — top or bottom — or all belts. This assures all belts start under equal strain. Now, move the sheaves apart until the belts are seated in the grooves and the slack is taken up.

Check final sheave alignment

Once again, check sheave alignment with a straightedge and observe:

- parallel position of the sheave shafts
- correct alignment of the sheave grooves

Note: Mount sheaves as close to the bearings as practical to avoid excessive loads on the bearings and shafts.

Tension belts

The key to long, efficient, trouble-free belt operation is proper tension. If belts are too loose, the result is slippage, rapid belt and sheave wear, and loss of productivity. Conversely, too much tension puts excess strain on belts, bearings, and shafts, and causes premature wear of these components. Follow this tensioning guideline: the proper tension for a V-belt is the *lowest* tension at which the belt won't slip or squeal under peak load.

Note: Never use belt dressing to stop belts from slipping. Tighten the belts and/or check for worn sheave grooves.

To tension belts, adjust the center distance until the belts appear fairly taut. When struck with the hand, belts will bounce back with a springy motion. Run the drive for about 15 minutes to seat the belts, and apply full load. If the belts slip or squeal, apply more tension. When the drive is in motion, a slight sag on the slack side is normal.

An alternate method of tensioning is to use the simplified force/deflection method, as follows:

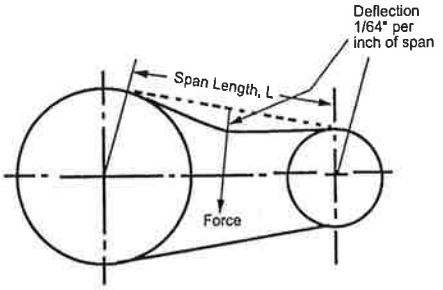
Force/deflection method

1. Measure the span length "L" of your drive (see illustration at right).
2. At the center of the span, apply a force perpendicular to the belt. Measure the force required to deflect the belt 1/64" per inch of span length. For example, for a 100" span, the deflection would be 100/64, or approximately 1 1/2" inches.
3. Compare the force required to the recommended ranges in the tables below. Tighten or loosen the belt to bring it into the recommended range.
4. When you install new belts, tighten them to "initial tension" forces shown in the tables. This tension will drop during the run-in period.

V-Belt Tensioning

V-Belt Cross Section	Small Sheave Diameter Range (Inches)	Recommended Deflection Force (Lbs.)		
		Initial Installation	Retensioning	
			Maximum	Minimum
A	- 3.0	3.6	3.1	2.4
	3.1 - 4.0	4.2	3.6	2.8
	4.1 - 5.0	5.2	4.6	3.5
	5.1 -	6.1	5.3	4.1
B	- 4.6	7.3	6.4	4.9
	4.7 - 5.6	8.7	7.5	5.8
	5.7 - 7.0	9.3	8.1	6.2
	7.1 -	10.0	8.8	6.8
C	- 7.0	12.5	10.7	8.2
	7.1 - 9.0	15.0	13.0	10.0
	9.1 - 12.0	18.0	16.3	12.5
	12.1 -	19.5	16.9	13.0
D	12.0 - 13.0	25.5*	22.1	17.0
	13.1 - 15.5	30.0*	26.0*	20.0
	15.6 - 22.0	32.0*	28.0*	21.5
E	18.0 - 22.0	45.0*	39.0*	30.0*
	22.1 -	52.5*	45.5*	35.0*
AX	- 3.0	5.1	4.4	3.4
	3.1 - 4.0	5.5	4.8	3.7
	4.1 - 5.0	6.0	5.2	4.0
	5.1 -	6.7	5.9	4.5
BX	- 4.6	10.0	8.7	6.7
	4.7 - 5.6	11.0	9.5	7.3
	5.7 - 7.0	11.5	9.9	7.6
	7.1 - 12.0	10.1	7.8	
CX	- 7.0	18.0	15.6	12.0
	7.1 - 9.0	19.5	16.9	13.0
	9.1 - 12.0	20.0	17.6	13.5
	12.1 -	21.0	18.2	14.0
3V	2.65 - 3.35	4.6	4.0	3.1
	3.65 - 4.50	5.5	4.8	3.7
	4.75 - 6.0	6.4	5.6	4.3
	6.5 - 10.6	7.3	6.4	4.9
5V	7.1 - 10.3	16.5	14.3	11.0
	10.9 - 11.8	19.5	16.9	13.0
	12.5 - 16.0	21.0	18.2	14.0
8V	12.5 - 16.0	39.0*	33.8*	26.0*
	17.0 - 20.0	45.0*	39.0*	30.0*
	21.2 - 24.4	51.0*	44.2*	34.0*
3VX	2.2 - 2.5	4.8	4.2	3.2
	2.65 - 4.75	5.7	4.9	3.8
	5.0 - 6.5	7.2	6.2	4.8
	6.9 -	8.7	7.5	5.8
5VX	- 5.5	15.0	13.0	10.0
	5.9 - 8.0	19.0	16.9	13.0
	8.5 - 10.9	21.0	18.2	14.0
	11.8 -	22.0	19.5	15.0

Note: For banded belts, multiply the force in the table by the number of belts in the band.



Inspect belt drive in 24-48 hours

During the 24-48 run-in period, the initial stretch is taken out of the belts and the belts seat lower in the sheaves. Check belt tension to assure it falls between the maximum and minimum values shown in the tables to the left.

Belt Storage Tips

Under proper conditions, belts can be stored for many years without shortening service life. Follow these guidelines:

- Store belts in a cool, dry, dust-free area, away from radiators and direct sunlight. Temperatures below 85° and relative humidity below 70% are recommended.
- Store belts away from ozone producing unguarded fluorescent lights, mercury vapor lights, and high voltage electrical equipment.
- Don't store belts near chemicals, oils, solvents, lubricants, or acids.
- Belts can be coiled on shelves or hung on pegs. Avoid sharp bends and stresses that can cause permanent deformation and cracks. Stack belts no higher than 12" to prevent damage to bottom belts. When hanging, coil longer belts to prevent distortion from belt weight.

Synchro-Link® Timing Belt Drives

Installation

Inspect timing belt pulleys for dirt, rust, damage, and wear. Clean pulleys as needed; replace worn or damaged pulleys.

Check that the pulley support structure is rigid. Loose supports cause center distance variation, shaft misalignment, and pulley-tooth disengagement.

Check drive alignment with a straightedge and make sure pulleys and shafts are parallel. On a long-center drive, it's often advisable to slightly offset the driveN pulley to compensate for the belt's tendency to run against one flange of the driveR pulley.

Never force or pry a belt over the pulley flange. Reduce center distance or idler tension, or remove one or both pulleys. Lay the belt over the pulleys and adjust the take-up until the belt teeth mesh securely with the pulley grooves.

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Tensioning

Timing belts should fit the pulleys snugly — neither too tight nor too loose. The "tooth grip" principle eliminates the need for high initial tension. A snug belt-pulley fit extends belt and bearing life, and gives quieter operation.

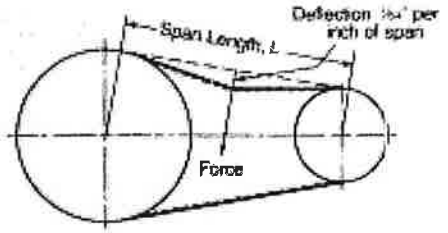
Measure span length ("L" in illustration below) and apply a force perpendicular to the belt. Measure the force required to deflect the belt 1/64" per inch of span length. Compare the force required with the table below and tighten or loosen the belt as required, to bring it into the recommended range.

For example, an H pitch belt, 1" wide with a span of 30", should take a force of 5.2-6.8 lbs. to deflect the belt 30/64", or about 1/2".

Timing Belt Tensioning

Belt Size		012	019	025	031	037	050	075	100	150	200	300	400	500	600
Belt Width		1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	5"	6"
MXL	Max.	.10	.15	.24	.35	.42	.62								
	Min.	.05	.09	.13	.19	.22	.33								
XL	Max.			.42	.55	.66	1.1	1.9							
	Min.			.20	.31	.37	.57	1.0							
L	Max.						1.3	2.1	2.9	4.7	6.4				
	Min.						1.0	1.5	2.2	3.4	4.6				
H	Max.							4.7	6.8	10.4	14.3	22.4			
	Min.							3.7	5.2	8.2	11.2	17.6			
XH	Max.										17.7	27.9	39.7	51.0	62.2
	Min.										16.3	25.8	36.7	47.0	57.3
XXH	Max.										40.5	63.9	90.7	117.2	142.1
	Min.										21.5	34.0	48.1	62.3	75.2

Units are lbs.



Taper-Lock® Pulleys

To install:

1. Place bushing in the pulley.
2. Apply oil to both the thread and the point of setscrews. Place screws loosely in pull-up holes.
3. Make sure the bushing is free in the pulley. Slip the assembly onto the shaft and position it for proper belt alignment.
4. Tighten the screws alternately and progressively until they are tight. To increase leverage, use a wrench or length of pipe.
5. Tap the large end of the bushing (use hammer and block or sleeve to prevent damage). Tighten the screws to the torque values shown in the following table. Fill the other holes with grease to keep dirt out.

Taper-Lock® is a registered trademark of Reliance Electric.

Torque Values for Tightening TL Bushings

TL Bushing	Wrench Torque (In. Lbs.)
TL1008	55
TL1210	175
TL1215	175
TL1610	175
TL1615	175
TL2012	280
TL2517	430
TL3020	800
TL3535	1000
TL4040	1700

To remove:

1. Remove both setscrews.
2. Apply oil to both the thread and point of one setscrew. Insert this screw in the tapped removal hole, and tighten the inserted screw until the bushing is loose in the sheave. (Note that one setscrew is not used for removal.)

Rib Ace® Drives

Installation

Clean rust and dirt from Rib Ace sheaves; replace worn or damaged sheaves. Sheave alignment is very important, and should be checked with a straightedge as shown on page 2.

Never force or pry a Rib Ace belt over the sheaves. Reduce the center distance and lay the belts over the sheaves.

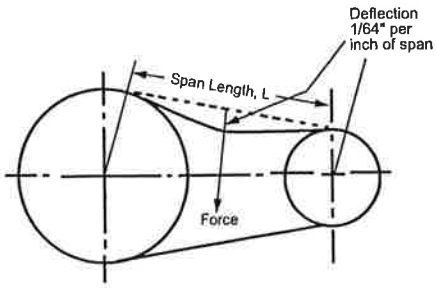
Tensioning

Measure span length ("L" in illustration below) and apply a force perpendicular to the belt. Measure the force required to deflect the belt 1/64" per inch of span. Multiply the number of ribs by the force "F" per rib in the chart below, compare this to the force required, and loosen or tighten the belt as needed.

Run the drive briefly to seat the belt, and recheck the tension. At least one sheave should be freely rotating during the tensioning procedure.

Rib Ace Tensioning

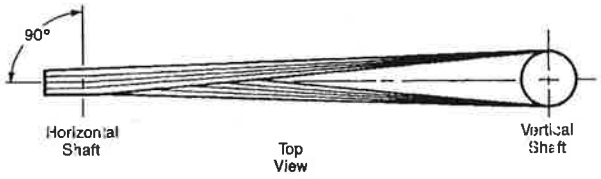
Belt Cross Section	Small Sheave Diameter Range	Force "F" Lbs./Rib
J	1.32 - 1.67	0.4
J	1.77 - 2.20	0.5
J	2.36 - 2.95	0.6
L	2.95 3.74	1.7
L	3.94 - 4.92	2.1
L	5.20 - 6.69	2.5
M	7.09 - 8.82	6.4
M	9.29 - 11.81	7.7
M	12.40 - 15.75	8.8



Quarter Turn Drives

Quarter turn V-belt drives are used to transmit power from a horizontal shaft to a vertical shaft, or vice versa. For maximum service on these drives, follow these guidelines:

1. Deep groove sheaves should always be used. Use individual — not banded — belts.
2. Center distance should be equal to 5 1/2 times the sum of the diameter of the large sheave plus its face width. This long center distance is necessary to insure the entry angle of the belts into the sheave grooves is 5° or less.
3. Speed ratio should not exceed 2.5:1. Greater speed ratios require such long center distances that a two-stage drive may be more feasible.
4. The center line of the horizontal shaft on the quarter turn drives should be above the center of the vertical shaft drive.



V-Flat Drives

Usually a converted flat belt drive, a V-flat drive has one V-grooved sheave and one flat pulley. For best results, follow these recommendations:

1. The arc of contact, or belt wrap, determines if a V-flat drive is practical. Use the formula $A=\frac{D-d}{C}$ where D is the large sheave diameter, d is the small sheave diameter, and C is the center distance. If A is between 0.5 and 1.5, the V-flat drive will have sufficient wrap to transmit the load under the proper tension.
2. The flat pulley should have a straight face for best operation. If the pulley is crowned, it should not exceed 1/4" per foot (on the diameter) of face width. When possible, remove the crown by machining.
3. Shock loads and/or pulsating loads should be avoided on V-flat drives.
4. Bando Combo™ (banded) belts are ideally suited for V-flat drives. Power King™ belts may also be used. Power Ace™ belts, with their narrow bottom and relatively greater height, will not remain stable on V-flat drives.

Idlers

V-Belt Idlers

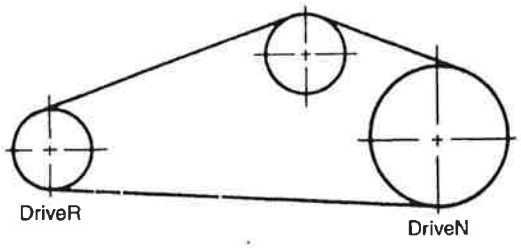
An idler is a grooved sheave or a flat pulley that does not transmit power. Idlers create additional bending stresses within a belt, and thus reduce horsepower ratings. Take this into account during drive design so belt life isn't reduced.

Idlers are generally used these circumstances:

- To tension and provide for take-up on a fixed center drive
- To dampen vibration in a long belt span
- To increase the arc of contact on a small sheave so the belt won't slip
- To guide belts around obstructions and to turn corners
- To function as clutching sheaves

Inside Idler

A grooved idler on the inside of the belts, on the slack side of the drive, is usually preferable to a back side idler. Place the idler close to the large sheave so the arc of contact is not greatly reduced on the small sheave. The diameter of the idler should be as large as, or larger than, the smallest loaded sheave.

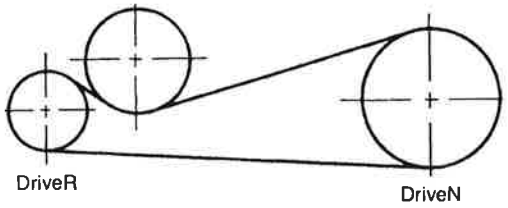


Inside Idler

Back Side Idler

A back side (or outside) idler, which is always flat because it contacts the top of the belts, increases the arc of contact on both sheaves, but it forces a backward bend in the belts. Such a bend will shorten life.

The diameter of a back side idler should be at least 1 1/2 times the diameter of the smallest loaded sheave. Locate the idler as close to the small sheave as possible, on the slack side of the drive.



Back Side Idler

Timing Belt Idlers

On timing belt drives, idlers are sometimes used for tensioning power take-off, or functional purposes. For maximum belt life, follow these guidelines:

- As with V-belts, install idler on slack side of drive.
- Inside idlers must be grooved. Back side (outside) idlers should be flat, uncrowned pulleys.
- Fixed idlers, rather than spring-loaded idlers, are recommended.

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Troubleshooting Guide

V Belts

Short Belt Life

Problem	Cause	Solution
Rapid failure with no visible reason	Worn sheave grooves (Check with groove gauge)	Replace sheaves
	Tensile cords damaged through improper installation	Replace all belts with a new set, properly installed
	Underdesigned drive	Redesign drive
	Wrong type or cross section belt	Replace all belts with correct type, properly installed
	Sheave diameter too small	Redesign drive
	Foreign substance caught between belts and sheave	Shield the drive
Soft, stick, swollen sidewalls. Low adhesion between plies	Oil or grease on belt or sheave	Clean belts and sheaves with degreasing agent or detergent and water. Remove source of oil or grease
Dry, hard sidewalls. Low adhesion between plies. Cracked belt bottom	High temperature	Remove heat source. Improve ventilation
Deterioration of rubber	Belt dressing	Don't use belt dressing. Clean belts and sheaves with degreasing agent or detergent and water. Tension belts properly
Rapid sidewall wear	Worn or damaged sheaves	Replace sheaves
Broken belts	Foreign object in drive	Shield drive
Spin burns	Belts slip under starting or stalling load	Retension drive
	Sheave diameter too small	Redesign drive
	Load miscalculated – drive underdesigned	Redesign drive
Cracked bottom	Sheave diameter too small	Redesign drive
	Back side idler too small	Replace with an inside idler on slack side, or redesign
	Slippage	Retension drive
	High temperature	Remove heat source. Improve ventilation
Cut bottom	Belt ran off sheave	Check tension and alignment
	Foreign object in drive	Shield drive
	Improper installation	Replace all belts with a new set, properly installed
Extreme cover wear, worn corners	Belt rubs against guard or other obstruction	Remove obstruction or realign drive
	Improper tension	Retension drive
	Dirt on belt	Clean belt, shield drive
	Sheaves rusted, sharp corners or burrs on sheaves	Repair or replace sheaves
	Sheaves misaligned	Align sheaves

Belt Stretch

Belts stretch unequally	Misaligned drive	Realign drive
	Tensile cord broken from improper installation	Replace all belts with a new set, properly installed
Belts stretch equally	Insufficient take-up allowance	Check take-up and follow guidelines
	Overloaded or underdesigned drive	Redesign drive

Belt Turnover

	Severe vibration and shock loads	Use Bando Combo belts
	Foreign material in grooves	Shield drive
	Misaligned sheaves	Realign sheaves
	Worn sheave grooves (Check with groove gauge)	Replace sheaves
	Tensile cord broken from improper installation	Replace all belts with a new set, properly installed
	Belt undertensioned	Retension drive
	Incorrectly placed flat idler pulley	Position idler on slack side of drive as close as possible to driveR sheave

Belt Noise

	Belt slip	Retension
	Misaligned sheaves	Realign sheaves
	Wrong belt type	Replace cut edge with wrapped belt

Belt Vibration

	Shock loads	Use Bando Combo belts
	Incorrectly placed flat idler pulley	Position idler on slack side of drive, as close as possible to driveR sheave
	Distance between shafts too long	Install idler
	Belt lengths uneven	Replace all belts with a new matched set
	Belts too loose	Retension drive

Severe Slippage

	Spin burns	Retension drive
	Too few belts	Redesign drive

Troubleshooting Guide

Problem	Cause	Solution
	Arc of contact too small	Install back side idler on slack side, or use timing belt
	Oil or water on belt	Clean belts and sheaves, shield drive
Improper DriveN Speed		
Incorrect driveR to driveN ratio	Design error	Redesign drive
Installation Problems		
Belts too long or short at installation	Design and/or belt selection error	Check design and selection
Belts mismatched at installation	Mixed used and new belts	Replace all belts with new belts
	Mixed belts from different manufacturers	Replace with belts from the same manufacturer
	Worn sheave grooves	Replace sheaves
Hot Bearings		
Drive overtensioned	Worn sheave grooves, belts bottom out	Replace sheaves
Sheave diameter too small	Design error	Redesign drive
Bad bearings	Underdesigned or poor maintenance	Check bearing design and maintenance
Drive undertensioned	Belts slip and cause heat build-up	Retension drive
Sheaves too far out on shaft	Design error or obstruction	Place sheaves as close to bearings as possible
Combo™ (Banded) Belts		
Tie band cut and/or separated. Belts riding out of sheave grooves	Worn sheaves (Check with groove gauge)	Replace sheaves
	Sheave misalignment	Realign sheaves
	Belts undertensioned	Retension drive
	Foreign object in drive	Shield drive
All belts separated from tie band	Damage from belt guard	Adjust guard
	Worn idler sheave	Replace idler sheave
Frayed tie band	Obstruction on machine	Remove obstruction and realign drive
Blistered tie band	Foreign material between belts	Clean and shield drive
Cracked belt bottom	Slippage	Retension drive
Timing Belts		
Broken belts	Underdesigned drive	Redesign drive
	Sharp bend damaged tensile cord	Follow proper storage and handling procedures
	Belt was pried or forced on the drive	Follow proper installation guidelines
	Foreign object in drive	Shield drive
	Belt runs onto pulley flange	Align pulleys
Apparent belt stretch	Reduction of center distance or non-rigid mounting	Retension drive and/or reinforce mounting
	Pulley teeth poorly machined or worn	Replace pulleys. Install cover if drive is dusty
	Sudden equipment stops	Increase deceleration time or redesign time
	Belt doesn't engage pulley teeth	Retension drive
Tooth shear	Less than 6 teeth-in-mesh	Redesign drive, install back side idler, or use next smaller pitch
	Excessive load	Redesign drive
Tensile or tooth shear failure	Pulley diameter too small	Increase pulley diameter or use next smaller pitch
	Exposure to acid or caustic atmosphere	Protect drive or ask Bando about special construction belt
Excessive pulley tooth wear (on pressure face and/or O.D.)	Drive overload and/or excess belt tension	Reduce installation tension and/or increase drive load carrying capacity
	Insufficient hardness of pulley material	Use harder material or surface-harden pulley
Excessive jacket wear between teeth, exposing tensile cord	Excessive installation tension	Reduce installation tension
Excessive noise	Misalignment	Realign drive
	Excessive installation tension	Reduce tension
	Excessive load	Increase drive load carrying capacity
	Pulley diameter too small	Increase pulley diameter
Cracks in belt backing	High temperatures	Improve ventilation, remove heat source, or check with Bando for special construction belt
Softening of backing	Excess heat (over 200°F) and/or oil	Lower ambient temperature, protect from oil, or ask Bando about special belt construction
Excessive edge wear	Misalignment or non-rigid centers	Realign drive and/or reinforce mounting
	Bent flange	Straighten flange
Unmounting of flange or flange wear	Incorrect flange installation	Install flange correctly
	Misalignment	Realign drive

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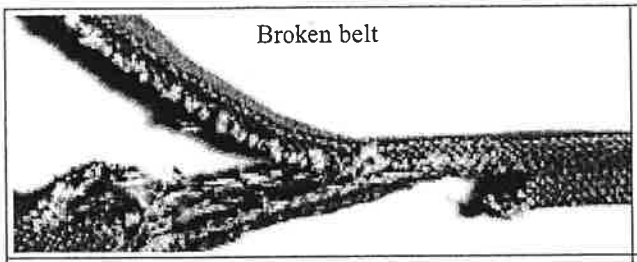
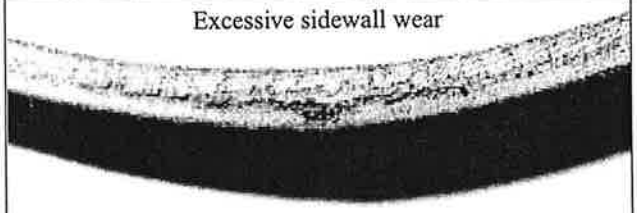
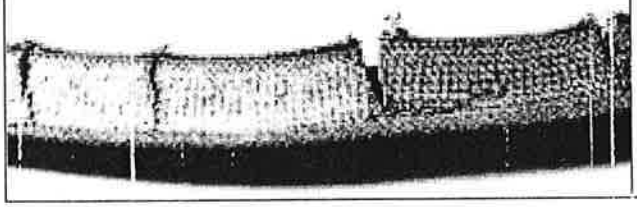
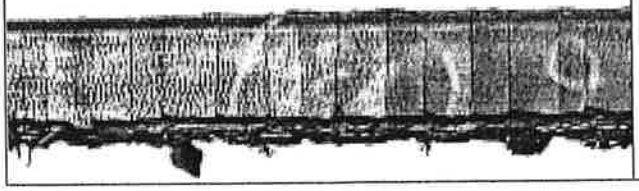
Troubleshooting Examples

Here are some examples of belt failures described on pages 6 and 7.
If you've encountered similar problems, check below for probable causes and solutions.

V-Belts

Problem	Probable Cause	Solution
Broken belt 	Foreign object in drive	Shield drive
Excessive sidewall wear 	Worn or damaged sheaves	Replace sheaves
Cracked bottom 	Sheave diameter too small	Redesign drive
	Back side idler diameter too small	Replace with an inside idler on slack side, or redesign
	Slippage	Retension drive
	High temperature	Remove heat source. Improve ventilation

Timing Belts

Broken belt 	Underdesigned drive	Redesign drive
	Sharp bend caused tensile cord damage	Follow proper storage and handling procedures
	Belt was pried or forced on the drive	Follow proper installation guidelines
	Foreign object in drive	Shield drive
	Belt ran onto pulley flange	Align pulleys
Excessive sidewall wear 	Misalignment or non-rigid centers	Align drive and/or reinforce mounting
	Bent flange	Straighten flange
Cracks in belt backing 	High temperatures	Remove heat source. Improve ventilation. Check for special belt construction

Twin City Fan & Blower

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Centrifugal Fans

ENGINEERING SUPPLEMENT
ES-52
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Contents

Introduction

The purpose of this manual is to provide instructions that complement good general practices when installing or operating fans manufactured by Twin City Fan & Blower. It is the responsibility of the purchaser to provide qualified personnel experienced in the installation, operation, and maintenance of air moving equipment.

Instructions given in the body of this manual are general in nature and apply to a variety of models manufactured by Twin City Fan & Blower. Most units can be installed and maintained with the instructions given.

Special applications may require additional information. These instructions are supplied in the form of attached appendices. Use the instructions in the appendix if the directions in this manual differ from instructions in the appendix.

As always, follow good safety practices when installing, maintaining and operating your air moving equipment. A variety of safety devices is available. It is the user's responsibility to determine adequate safety measures and to obtain the required safety equipment.

Shipping and Receiving

All Twin City Fan & Blower products are carefully constructed and inspected before shipment to insure the highest standards of quality and performance.

Compare all components with the bill of lading or packing list to verify that the proper unit was received.

Check each unit for any damage that may have occurred in transit. Any damage should be reported immediately to the carrier and the necessary damage report filed.

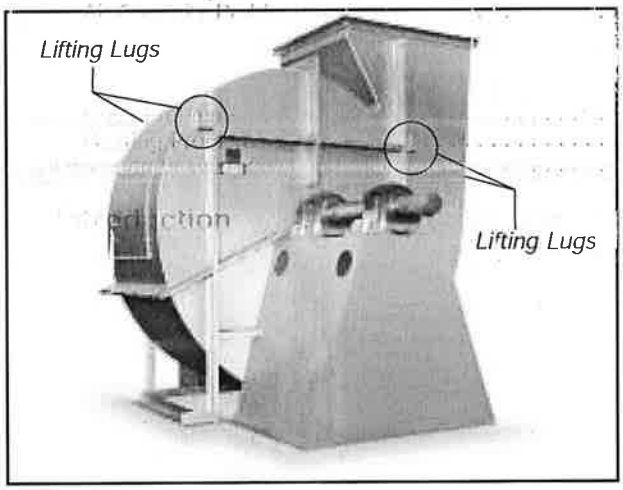
Handling

Handling of all air moving equipment should be conducted by trained personnel and be consistent with safe handling practices. Verify the lift capacity and operating condition of handling equipment. Maintain handling equipment to avoid serious personal injury.

Units shipped completely assembled may be lifted with slings and spreader bars. Use well-padded chains, cables or nylon straps. On most units, lifting lugs are provided for attaching chains (see Figure 1). Lift the fan in a fashion that protects the fan and fan coating from damage. Never lift a fan by the inlet or discharge flange, shafting or drives, wheel or impeller, motor or motor base, or in any other manner that may bend or distort parts.

Partial or disassembled units require special handling. All parts should be handled in a fashion which protects the coatings and parts from damage. Components should be handled such that forces are not concentrated and bending or distortion cannot occur.

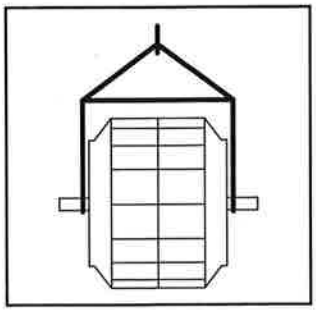
Figure 1. Lifting Lug Locations



Housings should be lifted using straps and spreaders. Do not distort housing or side plates when lifting.

Bearing pedestals should be lifted using straps or padded chains. Under no circumstances should an attached or separated bearing pedestal be lifted by the shaft, bearings, drives, motor or wheel.

Figure 2. Moving Shaft and Wheel with Spreader Bar



The shaft and wheel assembly may be lifted using a hoist and a spreader with a sling around the shaft at points nearest the wheel (see Figure 2). Take care not to scratch the shaft where the wheel or bearings will be mounted. Never lift or support the assembly by the wheel. Always support the assembly by the shaft when lifting or storing. Do not sup-

port the shaft or the wheel on housing sides. Use only the key provided with the shaft and wheel.

Wheels shipped separately can be lifted by slings running through the blades and around the hub. Never lift the wheel by blades or flanges. Always transport wheels by lifting. Do not roll the wheel as this can damage coatings and change the balance of the wheel.

Bent shafting is a source of vibration and bearing failure, so handle the shaft with care. Any scratches on the shaft may be removed with fine emery cloth or a stone.

Short Term Storage

If fan installation is to be delayed, store the unit in a protected area. Protect the fan and motor bearings from moisture and vibration (or shock loading).

Long Term Storage

Prior to Storage — Fan bearings (and motor bearings per the motor manufacturer's specifications) are to be greased at the beginning of extended storage. On belt driven units the belt tension should be reduced to less than half the specified value for the fan's design to prevent a sag/set from forming in the shafts and belts. If the unit was supplied with a motor the motor windings should be meggered at this time and recorded for comparison prior to placing in service. If the fan housing was supplied with a drain connection, this plug should be removed to prevent moisture from accumulating in this portion of the unit during storage.

Storage — Fans should be stored indoors whenever possible where control over temperature, shock and dust is reasonably maintained. If the unit is to be stored outside in the elements, it should be covered with a water resistant material. The bearings should be shielded individually from water and dirt; however, do not tightly seal them to avoid trapping condensation. Stored equipment should be housed on a clean, dry floor or blocked up off the ground to prevent units from sitting in any water or on the ground. If shock or vibration will be present during storage the unit may need to be placed on some type of vibration dampening material to aid in preventing brinelling of the bearing surfaces.

Periodic Check — On a monthly interval the equipment should be checked to ensure that it has remained in an acceptable stored condition. The fan (and motor if supplied) should be rotated several times while adding enough grease to replenish the bearing surfaces with fresh grease or to maintain a full bearing cavity. Grease used must be compatible with that already supplied in the motor and fan bearings. The fan impeller should be left at approximately 180 degrees from that of the previous month to prevent the shaft and impeller from taking a set in one position. Storage records should be maintained which indicate the above requirements have been followed. Consult the motor manufacturer for proper storage, space heater connection and lubrication if the unit was supplied with one.

Startup — When the unit is removed from storage all the bearing grease should be purged and replenished with fresh grease per lubrication decal. The motor should be meggered to verify that the resistance is still at a satisfactory level compared to the value recorded prior to storage.

Foundations and Supporting Structures

Floor mounted fans should be installed on a flat, level, rigid concrete foundation with a mass at least three times that of the assembly supported. The plan area should be no more than twice that required by the equipment. Foundations with larger areas should have correspondingly larger mass. Anchor bolts should be "L" or "T" shaped with sufficient length for nuts, washers, shims, and threads for draw-down. Each bolt should be placed in a sleeve or pipe with a diameter larger than the bolt to allow for adjustment.

Fans mounted to or within a structure should be placed as close as possible to a rigid member such as a wall or column. The structure must be designed for rotating equipment; static design for strength is not sufficient to insure proper operation. Supports for suspended fans must be cross-braced to prevent side sway. Structural resonance should be at least 20% from fan operating speed. Vibration isolators should be used where applicable.

Any ducting should have independent support; do not use the fan to support ducting. Isolating the fan from ductwork with flex connections eliminates transmission of vibration. Fans handling hot gases require expansion joints at both the inlet and discharge to prevent excessive loads caused by thermal growth.

Fan Installation, Factory Assembled Units

Follow proper handling instructions given earlier.

1. Move the fan to the final mounting position.
2. Remove skid, crates, and packing materials carefully.
3. If supplied, place vibration pads or isolation base on mounting bolts. Line up holes in fan base with bolts.
4. Place fan on mounting structure. Carefully level unit using shims as required at all mounting hole locations. Bolt down the unit.
5. Any grout may now be used. Bolt the fan in position before applying grout. Do not depend upon grout to support rotating equipment.
6. Continue with Operations Checklist.

Additional instructions may be given for some fan models, components and accessories in the appendix.

Fan Installation - Disassembled Units

A unit is considered "disassembled" if any component required for proper operation is shipped or supplied separately or in pieces. Reference earlier instructions concerning proper handling of fan components.

Instructions for Mounting and Assembly of Unit:

1. Move lower housing/framework to mounting location.
2. If vibration pads or bases are used, place on bolts first. Place lower housing assembly onto bolts.
3. Level and shim if required. Bolt into place.
4. If separated pedestal or bearing pedestal:
   a. Bring bearing pedestal to desired location.
   b. Place any vibration base or pads into place. Set bearing pedestal on bolts.
   c. Never distort bearing pedestal by forcing it to align with a non-level surface. Shim beneath the pedestals as required.
   d. Check bearing centerline height. Change centerline height to match centerline height of housing. High temperature units may require the housing centerline to be lower when cold so that it will be centered when hot.
   e. Measure from housing to bearing pedestal to bring bearing pedestal into square with housing (a large square may also suffice).
   f. Bolt into position.
5. Shaft and wheel assembly preparation:
   a. Clean protective coating off shaft with solvent. Do

not touch clean areas of shaft with hands. Perspiration can cause rust or pitting over time.

b. Remove keys from shaft.

c. Clean inside of wheel bore with solvent. Make sure set screws will not interfere when inserting shaft into wheel bore.

6. Arrangement 1, 9 or 10: Drive Component Assembly (See Figure 3):

a. Insert shaft into wheel from back side of wheel.

b. When shaft is flush with wheel hub, put key into keyway and tighten wheel set screws.

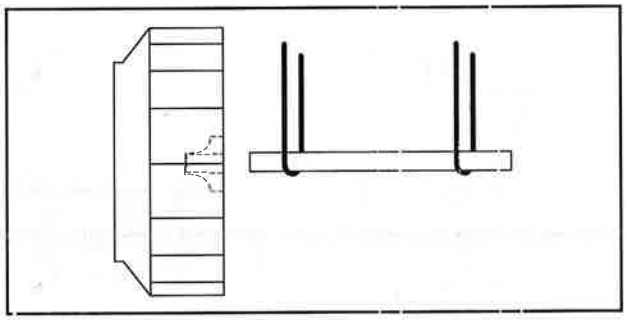
c. Insert shaft through opening in drive side. (If split housed unit, lower into position.)

d. Install bearings onto shaft. Do not tighten bearing set screws at this time. The bearing housing should be perpendicular and the bearing base parallel to the axis of the shaft to prevent loads caused by misalignment.

e. Mount assembly, bolt bearings to drive stand. Shaft must be parallel with side of bearing pedestal. After aligning and bolting bearings to pedestal, tighten bearing set screws. Continue with step 8.

7. Arrangement 3 (Split-housed) Units (See Figure 4):

Figure 3. Drive Component Assembly

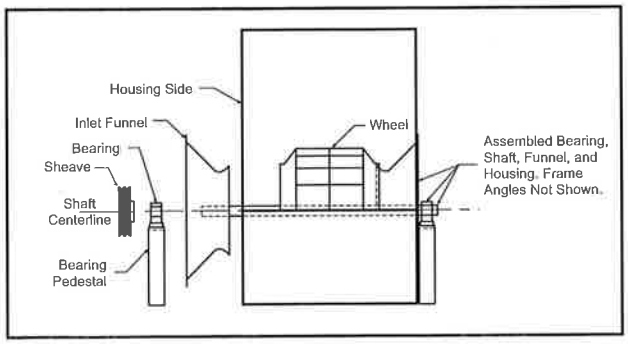


a. Parts on DWDI units are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), funnel, drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. Center wheel in funnels.

b. Parts on SWSI are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. (See Figure 6 for wheel-funnel overlap.)

c. Assemble parts in above order on shaft.

Figure 4. Split-housed Drive Component Assembly



d. Move assembly into position. Lightly bolt bearings into place.

e. Shaft should be parallel with discharge of housing. Move bearings to accommodate.

f. Level shaft; shim bearings if required. Tighten bearing set screws.

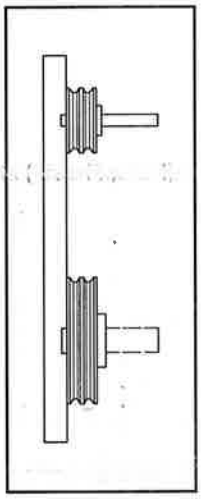
8. Install motor on base. Carefully align shafts for drive installation.

9. Mount drives as follows:

a. Slip (do not pound) proper sheave onto corresponding shaft as close as possible to bearing. CAUTION: PLACING FAN SHEAVE ON MOTOR CAN OVERSPEED WHEEL AND CAUSE STRUCTURAL FAILURE.

b. Align sheaves with a straightedge extended along perimeters of both sheaves, just making contact in two places on outside the perimeters of both sheaves (see Figure 5).

Figure 5. Sheave Alignment



c. Tighten down sheave bolts.

d. Install a matched set of belts. Slide the motor to obtain slack and tighten belts. Using a pry will damage belts.

e. Tighten belts to proper belt tension. Ideal tension is just enough tension so that belts do not slip under peak load. Recheck sheave alignment.

f. After initial installation of belts, recheck belt tension again after a few days to adjust belt tension. (New belts require a break-in period of operation.)

10. Install any safety devices or accessories supplied. (Accessories commonly used are inlet vanes, shaft seals and shaft coolers, plugs, dampers, and inlet or discharge screens. Refer to appropriate documents in appendix.)

11. Grout may now be applied. Grout is used to distribute loads and should not be used as the sole support of any rotating equipment.

12. When connecting the fan to the system, it is recommended that the inlet and discharge be isolated from the system with flex connections (where practical) to block transmitted vibration. All duct connections to the fan should be independently supported. Do not use fan to support duct.

Fan Operation - Safety

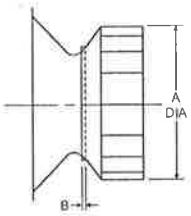
For general safety practices for air moving equipment, see AMCA Bulletin 410.

Twin City Fan & Blower has many safety accessories available. These safety devices include (but are not limited to) belt guards, shaft guards, inlet and discharge screens. The use, abuse, or non-use of safety devices is the responsibility of the purchaser.

Facility-related safety conditions include fan accessibility and location. How easily can non-service personnel access the unit? Is the fan in a hazardous duty environment? Was the unit ordered for this duty? Other concerns must also be addressed. All fans should be powered through switches which are easily accessible to service personnel from the

Figure 6. Wheel-Funnel Overlap

HIB, RTF, HRT, BC, BCS, TSL, BAF, SSI & APF



HIB, RTF, HRT Wheel Placement

Size	A	B	Size	A	B
180	20.50	0.31	400	45.25	0.69
200	22.50	0.34	450	50.00	0.75
220	25.00	0.38	490	55.13	0.81
240	27.50	0.44	540	61.00	0.91
270	30.38	0.47	600	67.50	1.00
300	33.50	0.50	660	74.25	1.13
330	37.00	0.56	730	82.00	1.22
360	41.00	0.63	800	90.75	1.34

BC, BCS, TSL & BAF SWSI Wheel Placement

Size	122	135	150	165	182	200	222	245	270	300	330
A	12.25	13.50	15.00	16.50	18.25	20.00	22.25	24.50	27.00	30.00	33.00
B	0.32	0.34	0.38	0.44	0.56	0.63	0.69	0.75	0.88	0.97	1.06

Size	365	402	445	490	542	600	660	730	807	890
A	36.50	40.25	44.50	49.00	54.25	60.00	66.00	73.00	80.75	89.00
B	0.94	1.03	1.13	1.25	1.38	1.56	1.69	1.88	2.09	2.28

*Use dimension "B" for positioning wheel on SSI and TSL.

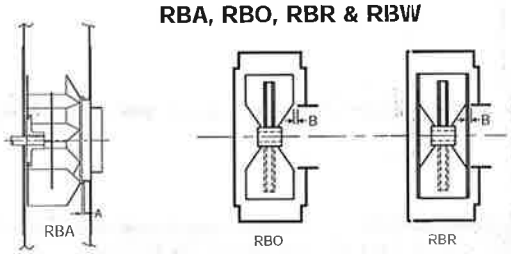
APF - Straight Bore Hubs Wheel Placement

Size	121	141	161	181	201	221	251	281	321	351	391	441	491	551	631	711	791
A	13.00	14.13	16.16	18.44	19.94	22.78	25.06	28.25	31.81	35.81	39.81	44.56	50.06	55.75	63.69	71.69	79.63
B	0.25	0.25	0.25	0.31	0.31	0.31	0.50	0.50	0.56	0.63	0.63	0.75	0.78	0.81	1.03	1.28	1.38

APF - Taper Lock Hubs Wheel Placement

Size	121	141	161	181	201	221	251	281	321	351	391	441	491	551	631
A	13.00	14.13	16.16	18.44	19.94	22.78	25.06	28.25	31.81	35.81	39.81	44.56	50.06	55.75	63.69
B	0.25	0.25	0.25	0.31	0.31	0.31	0.50	0.50	0.56	0.63	0.63	0.75	0.78	0.81	1.03

RBA, RBO, RBR & RBW



RBA Wheel Placement

Size	907	909	911	913	915	917	919	921	923	926	929	933	937	941	945	949	954	960
A	0.25	0.38	0.47	0.53	0.59	0.69	0.69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RBO / RBR Wheel Placement

Size	913	915	917	919	921	923	926	929	933	937	941	945	949	954	960
B	0.53	0.53	0.59	0.69	0.78	0.88	0.97	1.03	1.22	1.38	1.56	1.69	1.81	1.88	2.16

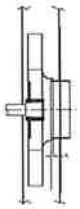
Note: On sizes 905-911 wheel is to be centered in housing.
RBW – Center wheel in housing.

MBW, MBO, MBR

MBW, MBO, MBR Wheel Placement

Size	196	224	252	280	308	336	365	421	477	533	589
MBW	0.50	0.44	0.38	0.25	0.38	0.44	0.56	0.63	0.75	0.75	0.88
MBO	0.50	0.44	0.38	0.25	0.38	0.44	0.56	0.63	0.75	0.75	0.88
MBR	0.25	0.25	0.25	0.25	0.25	0.38	0.50	0.69	0.81	0.94	1.00

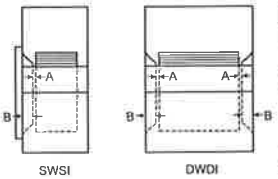
BCN



BCN Wheel Placement

Size	270	300	330	365	402	445	490	542	600	660	730
A	0.09	0.09	0.13	0.13	0.13	0.16	0.16	0.19	0.22	0.22	0.25

FC



FC Wheel Placement

Size	A	B	Size	A	B
10.5	0.47	0.69	30	0.75	4.38
12	0.25	1.88	33	0.81	5.00
15	0.44	2.19	36	0.75	5.00
18	0.50	2.25	39	1.06	6.38
21	0.69	2.88	42	1.69	7.50
24	0.81	3.00	48	1.50	7.13
27	0.69	3.13	54	1.00	10.50

fan. Every switch should have the ability to be "locked-off" by the service person and the key to be retained by this person to prevent accidental power of the fan while service is in process.

Operation Checklist

Verify that proper safety precautions have been followed:
- ☐ Electrical power must be locked off.

Check fan mechanism components:
- ☐ System connections are properly made and tightened.
- ☐ Bearings are properly lubricated.
- ☐ Wheel, drives and fan surfaces are clean and free of debris.
- ☐ Rotate the impeller by hand to verify it has not shifted in transit.
- ☐ Check wheel/funnel overlap. See Figure 6.
- ☐ Drives on correct shafts (not reversed).
- ☐ Check position of guards to prevent rubbing.

Check fan electrical components:
- ☐ Motor is wired for proper supply voltage.
- ☐ Motor was properly sized for power and rotational inertia of rotating assembly.
- ☐ Motor is properly grounded.
- ☐ All leads are properly insulated.

Trial "bump":
- ☐ Turn on power just long enough to start assembly rotating.
- ☐ Check rotation for agreement with rotation arrow. Does the assembly make any unusual noise? (See Figure 7)
- ☐ Check drive alignment and tension. Does this meet with drive manufacturer's recommendations?
- ☐ Correct any problems which may have been found. (Follow safety guidelines - shut power off). Perform checklist again until unit is operating properly.
- ☐ Run unit up to speed.

Verify fastener tightness. These may have loosened during shipment or installation.
- ☐ Set screws attaching wheel hub to shaft.
- ☐ Set screws in drive sheaves or coupling.
- ☐ Nuts on inlet funnel.
- ☐ Nuts and bolts holding motor.
- ☐ Nuts holding housing frame to base and base to ground.
- ☐ Nuts on accessories including shaft seal, access doors and pie-splits.
- ☐ Bolts in taper-lock bushings.
- ☐ Grease line connections.

After one week of operation, check all nuts, bolts and set screws and tighten if necessary.

Maintenance of Fans

This section contains general maintenance instructions for your Twin City Fan & Blower unit. For specific information about maintenance of components, particularly for special application fans, see the attached documents.

General Motor Maintenance

The three basic rules of motor maintenance are:
1. Keep the motor clean.
2. Keep the motor dry.
3. Keep the motor properly lubricated.

Keeping motors and windings clean is important because dirt and dust serve as thermal insulators. Heat normally dissipated by the motor is trapped causing overheating and/or premature failure. Blow dust and dirt out of windings and off the motor periodically. Use low pressure (50 psig) airstream so that winding damage does not occur. Keep the area surrounding the motor open so the air can circulate through the motor cooling fan. Follow normal mainte-

nance schedule given below.

Motors should be kept dry to avoid electrical short circuits. Motors kept in storage for long periods of time can have moisture condense on the windings. Be certain the motor is dry before using.

Some smaller motors are lubricated for life. Motor bearing lubrication, if required, must follow a rigorous schedule. Motors less than 10 hp running about eight hours a day in a clean environment should be lubricated once every five years; motors 15 to 50 hp, every 3 years; and motors 50 to 150 hp, yearly. For motors in a dusty or dirty environment or running 24 hours a day, divide the service interval by 2. If the environment is very dirty or high temperatures exist, divide the service interval by 4. Lubrication requirements are normally attached to the motor. Do not overlubricate.

Drive Maintenance

V-belt drives need periodic inspection and occasional belt replacement. When inspecting drives, look for dirt buildup, burrs or obstructions which can cause premature belt or drive replacement. If burrs are found, use fine emery cloth or a stone to remove the burr. Be careful that dust does not enter the bearings.

Check the sheaves for wear. Excessive slippage of belts on sheaves can cause wear and vibration. Replace worn sheaves with new ones. Carefully align sheaves to avoid premature sheave failure.

Observe belts for wear. If fraying or other wear is observed to be mostly on one side of the belts, the drives may be misaligned. Reinstall the drives according to instructions given for Fan Installation of Disassembled Units, part 9. Never use belt dressing on any belts.

When replacing belts, replace the entire set. After initial replacement and tensioning, recheck belt tension after a few days to adjust belt tension again. (New belts require a break in period of operation.)

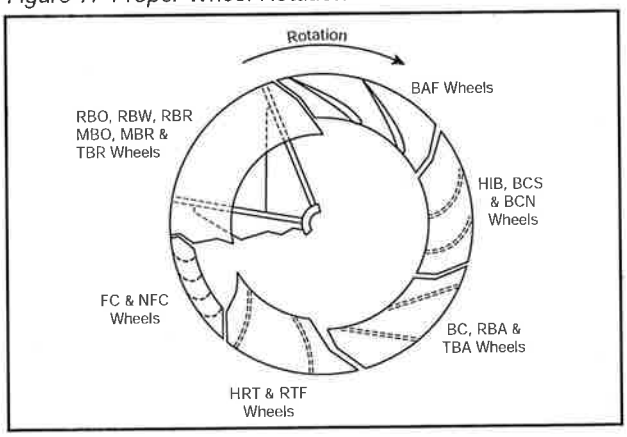
Bearing Maintenance

For instructions covering special lubrication intervals, bearing assembly or disassembly, or installation details, see attached documents. Any bearing which is disassembled should be kept separate from other bearing parts as components may not be interchangeable. Maintain cleanliness of components and bearings to prevent bearing contamination.

Bearing failure can occur from many causes. See Troubleshooting section for details.

Note: All speeds shown do not apply to all shaft sizes in that group. Consult the factory if in doubt of maximum speed for a particular bearing.

Figure 7. Proper Wheel Rotation



Lubrication

Proper lubrication of bearings helps assure maximum bearing life. All fans are equipped with decals indicating relubrication intervals for normal operating conditions. However, every installation is different and the frequency of lubrication should be established accordingly.

Figure 8. Safety & Lubrication Instructions for Fans with Ball Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)*
Ball Bearing Pillow Blocks

Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1/2" thru 1 11/16"	6	6	5	3	3	2	2	2	1
1 15/16" thru 2 7/16"	6	5	4	2	2	1	1	1	1
2 11/16" thru 2 15/16"	5	4	3	2	1	1	1		
3 7/16" thru 3 15/16"	4	3	2	1	1	1			

*Suggested initial greasing interval: Reubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

1. Lubricate with a high quality NLGI No. 2 or No. 3 multipurpose ball bearing grease having rust inhibitors and antioxidant additives. Some greases having these properties are:

   Shell - Alvania No. 2 — Mobil - Mobilith AW2/Mobilith SHC100
   Gulf - Gulfcrown No. 2 — American - Rykon Premium 2

2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Figure 9. Safety & Lubrication Instructions for Fans with Unit Roller Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)*
Spherical Roller Bearing - Solid Pillow Blocks

Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1 3/16" thru 1 7/16"	6	4	4	2	1	1	1	1	1/2
1 11/16" thru 2 3/16"	4	2	1 1/2	1	1/2	1/2	1/2	1/2	1/2
2 7/16" thru 3 7/16"	3	1 1/2	1	1/2	1/2	1/4	1/4		
3 15/16" thru 4 15/16"	2 1/2	1	1/2	1/4					

*Suggested initial greasing interval: Relubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

1. Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:

   Shell - Alvania No. 2 — Mobil - Mobilith AW2/Mobilith SHC100
   Texaco - Premium RB2 — American - Rykon Premium 2

2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Experience has shown that airborne moisture and heavy dust will dramatically reduce the life of the bearing lubricant. If any of these adverse conditions exist, it is recommended that bearings be regreased after several days of operation. Lubrication intervals can then be adjusted based on the condition of the purged grease.

Figure 8 illustrates the decal for ball bearings, Figure 9 the decal for solid pillow block spherical roller bearings, and Figure 10 shows the decal for split pillow block spherical roller bearings. Observation of the condition of the grease expelled from the bearings at the time of relubrication is the best guide as to whether regreasing intervals and the amount of grease added should be altered. This observation is particularly important when bearings operate continuously over 160°F.

Greases are made with different bases. There are synthetic base greases, lithium base, sodium base, etc. Avoid mixing greases with different bases. They could be incompatible and result in rapid deterioration or breakdown of the grease.

All bearings are filled with grease before leaving the factory. When the fans are started, the bearings may discharge excess grease through the seals for a short period of time. Do not replace the initial discharge because leakage will cease when the excess grease has worked out. Sometimes the bearing has a tendency to run hotter during this period and one should not get alarmed unless it lasts over 48 hours or gets above 220°F. When relubricating, use a sufficient amount of grease to purge the seals. Rotate bearings during relubrication where good safety practice permits.

For bearings with oil lubrication, sight gauges are installed so that a proper level can be reviewed and maintained. Sight gauges should be read with bearings not rotating.

Wheel and Shaft Maintenance

Periodically inspect the shaft and wheel for dirt buildup, corrosion, and signs of excess stress or fatigue. Clean the components and, when appropriate, apply new coatings. (Any addition of coatings or weld can create an imbalance.) Check the balance of the assembly.

Structural Maintenance

All structural components or devices used to support or attach the fan to a structure should be checked at regular intervals. Vibration isolators, bolts, foundations, etc., are subject to failure from corrosion, erosion, and other causes. Improper mounting can lead to poor operation characteristics or fan fatigue and failure.

Check metallic components for corrosion, cracks, or other signs of stress. Concrete should be checked to insure the structural integrity of the foundation.

Troubleshooting Guidelines

Use current safety practices when investigating fan or system performance problems. General safe practices and performance troubleshooting guidelines can be found in AMCA Publications 410 and 202, respectively. Fan application and field measurement procedures can be found in AMCA Publications 201 and 203.

Troubleshooting Performance Problems

The lists below indicate possible areas to check when air or sound values do not match expectations. Most fan problems can be pinpointed to one of these common causes.

Air Capacity Problems:

1. Resistance of system not at design rating. If resistance is lower than expected, both airflow and horsepower may be up. If resistance is higher than anticipated, air volume will be down.
2. Fan speed is not at design speed.
3. Air density not at design values. Also check air performance measurement techniques/procedures.
4. Devices for air modulation are closed or plugged. Also check filters.
5. Wheel mounted improperly or is rotating in reverse.
6. Parts of system or fan have been damaged or need cleaning.

Figure 10. Safety & Lubrication Instructions for Fans with Split Roller Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Spherical Roller Bearing - Split Pillow Blocks										Grease to be added at each interval
Speed (RPM)	500	750	1000	1500	2000	2500	3000	3500	4000	
Shaft DIA										
1 7/16" thru 1 15/16"	6	4½	4	4	3½	2½	2½	1	1	0.50 oz.
2 3/16" thru 2 11/16"	5	4½	4	2½	2½	1½	½	¼	¼	0.75 oz.
2 15/16" thru 3 15/16"	4½	4	3½	2½	1½	1	½			2.00 oz.
4 7/16" thru 4 15/16"	4	4	2½	1	½					4.00 oz.
5 7/16" thru 5 15/16"	4	2½	1½	1						7.00 oz.

*Suggested initial greasing interval: Remove bearing cap and observe condition of used grease after lubricating. Adjust lubrication frequency as needed. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required. Clean and repack bearings annually. Remove old grease, pack bearing full and fill housing reservoirs on both sides of bearing to bottom of shaft.

1. Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:

   Shell - Alvania No. 2 — Mobil - Mobilith AW2/Mobilith SHC100
   Texaco - Premium RB2 — American - Rykon Premium 2

2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Static Oil Lubrication

1. Use only highest quality mineral oil with a minimum viscosity of 100 SSU at the oil's operating temperature. The oil's operating temperature is approximately 10° greater than the bearing's housing. SAE values having this viscosity at the following operating temperature are:

   150° - SAE 20 — 160° - SAE 30 — 180° - SAE 40

2. Static oil level should be at the center of the lowermost roller (Do not overfill).
3. Complete lubrication change should be made annually.

Noise Problems:

1. Air performance is incorrect and fan is not at design point of operation. Fan forced to operate in an unstable flow region.
2. Bearing failure. Check bearings (lubrication).
3. Supply voltage high or inconsistent supply frequency. Adjustable frequency controllers can generate motor noise.
4. Objects which are installed in a high velocity airstream can generate noise. This includes flow sensors, turning vanes, etc.

5. Poor fan inlet conditions.
6. Acoustics or sound measurement procedure incorrect.

Vibration Problems:

1. Misalignment of drive components.
2. Poor foundations or mounting structure (resonances).
3. Foreign material attached to rotating components.
4. Damaged rotating components (bearings, shaft, fan, wheel, sheaves).
5. Broken, loose or missing set screws.
6. Loose bolts.
7. Vibration transmitted by another source.
8. Water accumulating in airfoil blades.
9. Fan is operating in stall or unstable flow region.

Motor Problems:

1. Incorrect wiring.
2. Speed of fan too high.
3. Parts improperly installed - binding.
4. Bearings improperly lubricated.
5. WR^2 capability of motor too low for application.
6. Protection devices may be improperly sized.

Drive Problems:

1. Belts improperly tensioned.
2. Drive alignment is poor.

Bearing Problems:

Generally speaking, Twin City Fan & Blower uses three types of bearings:

1. Ball bearing with set screw lock
2. Spherical roller bearings with set screw lock
3. Spherical roller bearings with adapter lock/taper lock feature to attach them to the shaft

Ball Bearing — These are self-aligning bearings and should present no alignment problems with one exception: i.e., on Sealmaster bearings there is a pin beneath the grease fitting which prevents the bearing's outer race from rotating. Should this pin jam, the bearing loses its alignment feature.

Common failure causes are (1) set screws loosening and the shaft turning within the bearing, and (2) crowned bearing supports. Loosen one bolt and measure the clearance between the pillow block and the support. Add shim to compensate.

Spherical Roller Bearings With Set Screw Lock — The self-aligning characteristic of these bearings is inherent in the spherical roller design. The closer that these bearings are to perfect alignment, the cooler they will operate.

Common failure causes are the same as with ball bearings, mainly set screws loosening and crowned bearing supports.

Spherical Roller Bearings With Adapter Lock — Again, the self-aligning feature is inherent in the spherical design. Good alignment results in a cooler operating bearing. The faster the bearing operates the more critical this becomes.

A common cause of failure is improper installation practice. Removing too much clearance from the bearing can result in preloading the bearing, resulting in premature failure; and removing not enough can result in the shaft rotating within the bearing. Properly tightened, this method of attaching a bearing to a shaft is second only to a press fit. Crowned bearing supports can also preload these bearings and should be checked by loosening one side of the bearing and checking for clearance.

Lubrication — The major cause of bearing failure is contamination of grease, insufficient grease, or incompatibility of grease. If a fan is to be stored for any length of time at the job site, the bearings immediately should be filled with grease while rotating the shaft and then the bearings should be regreased and rotated monthly. This will prevent moisture, which condenses within the bearing, from corroding the raceways. Most greases used on fan pillow blocks are lithium base. Use the greases shown on the bearing decal. Do not mix the bases without completely purging the initial grease.

Initially, follow the lubrication instruction on the side of the fan. The frequency of lubrication should be adjusted depending on the condition of the old grease being purged. This is the responsibility of the user. If the grease is dirty, the lubrication frequency should be more often.

a. Noise — If a bearing is increasing in noise intensity and/or vibration, it will probably result in failure.

b. Temperature — If a bearing temperature begins to gradually rise, it will generally result in failure. A bearing can operate up to 200 degrees and operate satisfactorily if the temperature remains constant and the bearing receives adequate lubrication. Remember that a roller bearing under the same load and speed will be somewhat more noisy and run warmer than a ball bearing. This is normal.

Rough handling and/or dropping a fan can result in brinelling the bearing. This appears as a clicking noise at first, then gradually worsens until failure.

When replacing a bearing, always align the bearings first, then bolt the pillow blocks to their support, rotate the shaft, fasten the bearings to it. If the bearing is fastened to the shaft first, tightening the pillow block bolts may bind the shaft and preload the bearings.

Limitation of Warranties and Claims

Seller warrants to the original purchaser that the goods sold hereunder shall be free from defects in workmanship and material under normal use and service (except in those cases where the materials are supplied by the buyer) for a period of one year from the date of original installation or eighteen (18) months from the date of shipment, whichever occurs first. The liability of seller under this warranty is limited to replacing, repairing, or issuing credit (at cost, F.O.B. factory and at seller's discretion) for any part or parts which are returned by buyer during such period provided that:

a. seller is notified in writing within ten (10) days following discovery of such defects by buyer, or within ten (10) days after such defects should reasonably have been discovered, whichever is less;

b. the defective unit is returned to seller, transportation charges prepaid by buyer.

c. payment in full has been received by seller or said products; and

d. seller's examination of such unit shall disclose to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair, alteration, act of God, or accident.

Seller cannot guarantee sound pressure levels or dBA.

No warranty made hereunder shall extend to any seller product whose serial number is altered, effaced or removed. Seller makes no warranty, express or implied, with respect to motors, switches, controls, or other components of seller's product, where such components are warranted separately by their respective manufacturers. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable to buyer for indirect, incidental collateral, or consequential damages of any kind. (BUYER'S FAILURE TO PAY THE FULL AMOUNT DUE WITHIN SIXTY (60) DAYS OF DATE OF INVOICE SHALL OPERATE TO RELEASE SELLER FROM ANY AND ALL LIABILITY OR OBLIGATION ARISING PURSUANT TO ANY WARRANTY, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, MADE IN CONNECTION WITH ANY CONTRACT FORMED HEREUNDER. BUYER AGREES THAT SUCH FAILURE TO PAY SHALL CONSTITUTE A VOLUNTARY WAIVER OF ANY AND ALL SUCH WARRANTIES ARISING PURSUANT TO SUCH CONTACT.)

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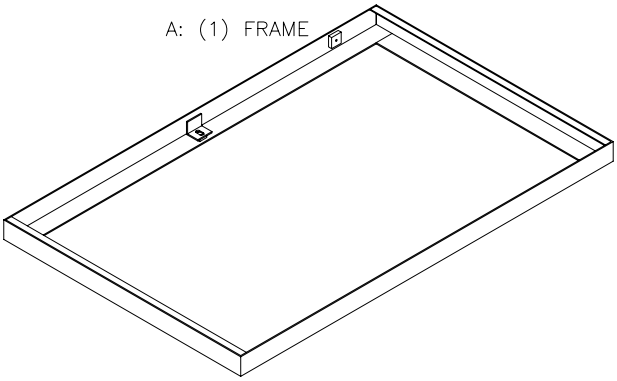
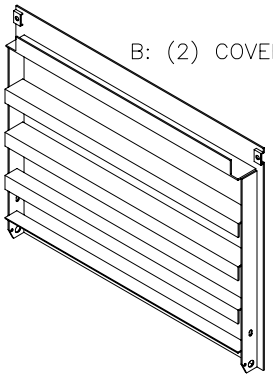
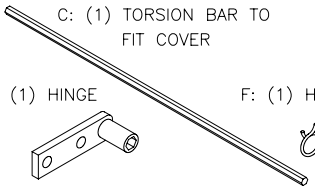
A: (1) FRAME



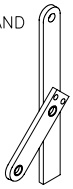
B: (2) COVER



C: (1) TORSION BAR TO FIT COVER



H: (1) KICKSTAND



D: (1) BLANK HINGE

E: (1) HINGE

F: (1) HOSE CLAMP

G: (1) BROACHED TORSION BLOCK TORSION BLOCK

I: (2) 1/2" CARIAGE BOLT AND NUT

J: (2) 1/2"x2 1/2" LARGE HEAD HEX BOLT

K: (1) 1/2x1 FLAT HEAD

L: (1) SOCKET SHOULDER SCREWS 1/2"x3/8"

M: (1) 3/8" HEX 1 1/2 LONG.

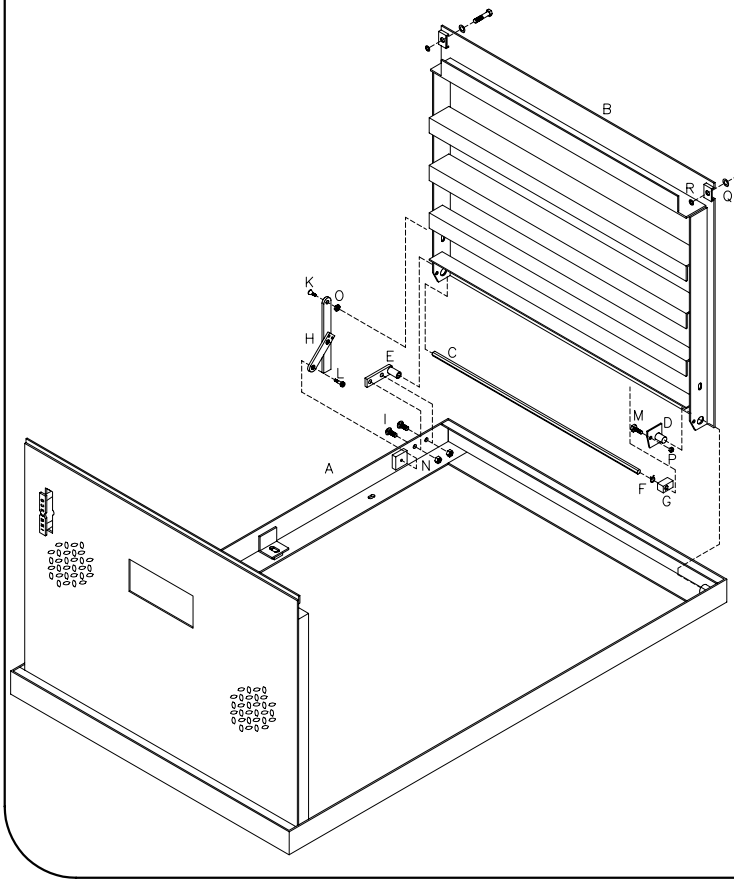
N: (2) 1/2" HEX NUT

O: (1) NYLOCK

P: (1) 3/8" HEX NUT

Q: (2) 1/2" WASHER

R: (2) 1/2" KEEPER



STEPS FOR ASSEMBY OF COVERS TO FRAME

1. Torsion block and broached hinge should be level with each other. Broached hinge can vary 10 degrees Depending upon how heavy door is.
2. Now take off torsion block and keep broached block on. be sure you keep torsion block facing the same way as when you took it off.
3. Nex, put torsion bar with broached block through hole as shown in illustration B.
4. Now put hose clamp on torsion bar approximately 1" from end as shown illustration C.

Illustration A

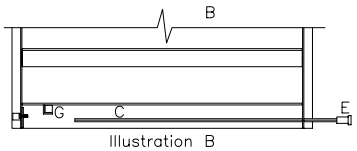


Illustration B

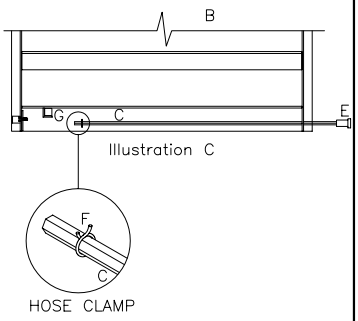


Illustration C

HOSE CLAMP

INWESCO

Prepared By: W.B
Date: 04-30-10

HARDWARE FOR FRAME & COVER DOUBLE DOOR ASSEMBLY

APPENDIX H General SVE System Troubleshooting Guide

Troubleshooting Chart

Symptom	Potential Cause	Possible Solution
Electrical Motor		
Motor will not start and there is no noise.	Motor may not be receiving the proper power.	Check fuses and power distribution between power lines to motor.
	Overload is tripped.	Reset overload.
	Main power may be off.	Check main power.
	Contactor may not be closing because motor is in manual position.	Switch motor to Auto position.
	Contactor may not be closing because PLC is not telling output to be on.	Check PLC operating sequence to determine if a start requirement is not met.
Motor will not start but makes a humming noise.	One of the phases of power is not getting to the Motor as a result of a blown fuse.	Change fuse.
	One of the phases of power is not getting to the Motor as a result of a poor wire connection.	Check wiring for a loose wire or a poor connection.
	The driven component (i.e. pump) will not spin and could be seized up.	Disassemble driven component, check clearances and clean internal components and replace any damaged components.
	Bearing on drive shaft of motor or driven component may be seized up.	Replace bearings.
Overloads trip immediately after startup.	Check for short circuit in motor windings.	Re-wind motor.
	One of the phases of power is not getting to the motor as a result of a blown fuse.	Change fuse.
	Motor power wires may be shorting out to ground.	Search for wiring short and replace wiring if required.
	Motor may have too much load or backpressure as a result of operating the driven component outside of its operating capabilities.	Check operating capabilities of driven component. I.e. Ensure positive displacement pump is not over pressured or that centrifugal pump is not operating at too high a flow rate.
Motors amps are above the allowable value on the nameplate.	Motor may be designed to operate on the upper limit.	Calculate maximum allowable amps. Name plate amps x safety factor.
	Driven component may have scale build up inside.	Clean internal components of driven component.
	Driven component may be rotating in the wrong direction.	Check direction of rotation and switch rotation of motor if it is incorrect.
	Check voltage of power. Low voltage results in high amps.	Adjust overloads for higher amps if the difference is only slight, otherwise change power or motor.
Centrifugal Pumps		
Pump does not produce sufficient pressure/vacuum.	Pump is not primed.	Prime pump.
	Pump is rotating in wrong direction.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to an obstruction located between the pump and gauge.	Check for flow restrictions and clean strainers or piping if required.
	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.

	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter	Replace filter and clean line.
Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Liquid Ring Pump		
Pump does not produce enough vacuum.	Pump is not primed.	Prime pump and start under vacuum.
	Service fluid is to low in seal oil tank.	Add seal oil.
	No restriction on inlet of pump.	Close valves to create suction.
	Dilution valve is open.	Close dilution valve.
	Service fluid is not flowing into the pump.	Check for flow restrictions in service fluid lines. Check strainer.
	Pump is rotating in the wrong direction.	Check and change direction if required.
	Vacuum gauge is not working correctly.	Replace vacuum gauge.
	Pump seals may be allowing air into the pump.	Check for leaking and replace seals if required.
	Pump is too small for application.	Replace pump.
	Vacuum relief valve is set too low.	Replace or reset vacuum relief valve.
	Air may be leaking into vapor lines.	Check for air leaks in vapor lines.
	Pump internal components are damaged.	Disassemble pump and replace components if required.
Pump is making a growling noise.	Cavitation is occurring.	Decrease the vacuum.
	Insufficient seal fluid flow or excessive seal fluid flow.	Increase/decrease seal fluid flow rate.
Pump is leaking.	Gaskets are faulty.	Replace gaskets.
	Mechanical seal has been overheated or is faulty.	Replace mechanical seal.
	Oil may be leaking from 1/8" vacuum relief valves in pump housing.	Remove valves and install plugs.
Pump is running too hot.	Seal fluid strainer is plugged restricting seal fluid.	Clean out strainer.
	LRP is not providing enough suction to draw sufficient seal fluid.	Increase seal oil suction. Pipe seal fluid into a higher vacuum port of pump.
	Seal fluid flow rate is too low.	Open seal fluid control valve to allow more seal fluid to enter the pump.
	Seal fluid heat exchanger is not working properly.	Check heat exchanger.
Excessive discharge pressure built up in seal oil tank.	Demister filter is plugged and requires replacement.	Replace demister.

	Seal oil is not being drawn out of demister filter through scavenger line.	Increase vacuum of LRP to allow oil to be sucked through scavenger line. Ensure that scavenger line has sufficient vacuum to draw oil out of the demister filter.
Seal Oil Low Level Alarm	Seal oil temperature may be operating too high causing the oil to evaporate.	Check seal oil operating temperature and increase seal oil flow.
	Seal oil suction line may be plugged causing seal oil to collect in bottom of demister filter.	Check for plugging of seal oil return line and clean or replace if required.
Oil Water Separator		
Water is in the oil outlet.	Skimmer opening is below the oil/water interface.	Adjust skimmer alignment to allow more oil to collect before skimming.
Oil is making its way to the outlet.	Water flow rate is too high.	Reduce flow rate through system.
	Filter media is plugged.	Replace or clean media.
	Oil discharge is plugged backing up OWS.	Drain oil down stream of skimmer.
Air to Air and Air to Fluid Heat Exchangers		
Heat exchanger fan is drawing too many amps.	See troubleshooting for motors.	
	Fan blade pitch and diameter may be wrong.	Change fan blade.
	Motor may be operating at wrong RPM for fan blade.	Replace motor or fan blade.
	Check clearance of fan blade.	Make adjustments if blade is making contact.
Phase Separator		
Water will not pump out of phase separator.	Base of separator may be plugged with sand.	Flush sand and debris out of separator.
Electric Solenoid Valve		
Valve will not completely shut.	May have dirt or rocks preventing it from shutting properly.	Disassemble and clean out internal components.
Valve will not open	Check for power to solenoid.	Trace power lines and determine why power is not going to valve.
	PLC may not be telling it to open.	Check start requirements in manual.
	Coil may be damaged or faulty.	Replace coil.
Level Switches		
Level switch is staying closed when water in tank drops below switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.
	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick up.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed closed regardless of the switch position.	Replace switch.
	Wiring to level switch may be shorting out to ground causing the switch to appear closed at all times.	Disconnect switch from system wiring and separate system wires so they are not in contact with each other or any metal. If the input is still on, the input wiring is being grounded somewhere. Find short and replace or fix wiring.
	IS barrier is shorted out internally.	Switch IS barrier with working barrier and if problem goes away then the barrier may be faulty and should be changed.
	Input wiring is loose in terminal strip.	Tighten terminal strip where field wiring is brought into panel.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.

Level switch stays open when water in tank is above the switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.
	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick down.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed open regardless of the switch position.	Replace switch.
	IS barrier is blown preventing the level switch signal from crossing the barrier.	Switch IS barrier with working barrier and if problem goes away then the barrier may be blown. If barrier is blown, the input wire on the right side of the barrier will have 24 V DC and the wire on the opposite side will have 0V DC.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.
Regenerative Blowers		
Blower does not produce sufficient pressure/vacuum.	Blower is not turned on.	Turn on blower.
	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Blower is not operating at required RPM.	Check and replace motor if required.
	Blower has wrong sized impeller.	Check impeller and replace if required.
	Pressure or vacuum is lost due to obstruction located between blower and gauge.	Check for flow restrictions and clean strainers or piping if required.
Blower is leaking.	Fittings are leaking on or around blower.	Tighten fittings.
Blower flow rate is too low.	Backpressure is too high for blower.	Reduce backpressure.
	Blower may not be sized correctly for process.	Replace blower.
	Blower impeller is too small.	Change blower impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Air Stripper		
Stripper leaks.	Gaskets are leaking.	Apply silicon grease to gaskets and close up stripper. If they cannot be fixed the gaskets may need to be replaced.
Pressure or vacuum is building up in stripper.	Stripper is being fouled by mineral precipitates.	Clean stripper with acid to dissolve precipitates.
	Airflow rate through stripper has risen or is above the design value.	Decrease airflow rate.
Stripper is not cleaning contaminants sufficiently.	Inlet concentrations are higher than the design values.	Decrease water flow rate to obtain required stripping capacity.
	Flow rate of water through stripper is too high.	Decrease flow rate allowing longer residence time in stripper.
	Water temperature is lower than the design (below 60 deg F).	Increase water temperature or slow down water flow rate or increase airflow rate.
	Airflow rate is not high enough.	Increase airflow rate or decrease water flow rate.
	Products that are not easily strippable may be in higher concentrations than originally planned.	Consult manufacturer with test results of discharge contaminants.
	Stripper may have been shut down manually causing the contaminated water in the trays to fall into the sump without being cleaned.	Allow stripper to go through proper shutdown cycle when stopping the unit.

	Stripper may be setup wrong allowing the water to bypass trays.	Check orientation of trays to ensure water will flow through each tray properly.
	Some contaminants may be present that are affecting the ability to strip other contaminants.	Consult manufacturer with test results of intake and discharge contaminants.
	Increase in pressure causes a decrease in airflow resulting in a decrease of contaminant concentrations.	See pressure rise in stripper troubleshooting above.
Water is collecting in discharge piping of stripper.	Air leaving the stripper is very humid and will condense some water in the pipelines.	Install a knockout drum in discharge line before air is piped to another section of the process.
	The stripper causes foaming of the water which results in water collecting in the discharge lines.	Test for foaming contaminants such as soaps and install antifoaming dosing system to prevent foaming.
	Airflow rate is higher than the design value causing water to be carried over into the discharge lines.	Decrease flow rate to within design range.
Stripper often shuts down on a high stripper sump alarm.	Transfer pump is flowing faster than the discharge pump.	Slow transfer pump or speed up discharge pump.
	Discharge pump is not working properly.	Troubleshoot discharge pump.
Moyno Pumps		
Pump does not produce sufficient pressure/vacuum.	Pump is not primed.	Prime pump.
	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to obstruction located between pump and gauge.	Check for flow restrictions and clean strainers or piping if required.
	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.
	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
	Pump was run in reverse allowing the rotor to spin off of the pump shaft.	Disassemble pump and screw rotor back onto shaft (See manufacturer's manual).
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Pressure Switch/Vacuum Switch		
Switch is not reacting at desired set point.	Switch is out of adjustment.	Change set point to desired value.

Switch is not working.	Switch may be faulty.	Remove input wires and test switch at desired pressure. If it does not trigger, it should be replaced.
Flow meter		
Flow meter is not rotating.	Dirt could have caused meter internals to jam up.	Disassemble flow meter and clean internal components.
Flow meter is rotating but pulse input is not working.	Switch on meter may be faulty.	Remove wiring and test contacts on meter to ensure that they are opening and closing. If not meter head needs to be replaced.
	Input wiring may be grounding out preventing the signal from opening and closing.	Test input wiring by isolating input wires and checking if input is on. If so you have a grounded input wire.
	Input to PLC is not working.	Simulate rotating meter by contacting input wires together and check for a detected flow rate and change in totalized flow.
Belt Driven Assemblies		
Squealing noise occurs on startup.	Belt is too loose.	Check tension of belt and tighten if required.
Excessive wear on bearings.	Belt is too tight.	Loosen belt tension.
Belt is wearing excessively.	Check orientation of blower and motor.	Adjust orientation if required.
Carbon Vessel		
Vessel is operating over pressure.	Silt may have collected in water phase vessel.	Remove lid and check for silt. Remove top layer of silt or replace vessel.
Vessel is breaking through earlier than expected.	Flow rate through vessel may be too high. Check design specifications.	Decrease flow rate.
	Air contaminant concentrations are higher than expected.	Test inlet concentrations.
	Check piping orientation to ensure that water is going in the top of water phase vessels and air is going in the bottom of air phase vessels.	Repipe vessel if piping is wrong.
	Ensure that there is not a large trapped air gap in the top of the water phase carbon vessel allowing the water to bypass a portion of the carbon.	Release air gap if present.
Bag Filter		
Vessel is operating over pressure.	Bag filter may be full of dirt and silt.	Remove cover and check for dirt buildup in the bag. Replace filter element if required.
	Equipment down stream of bag filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure.	Check pressure output of pump with pump curve. Replace pump if needed.
Filters are plugging too fast	Filter element micron size may be too low.	Install larger micron filter element.
	Filter pressure switch setpoint may be too low.	Increase high pressure shutdown setpoint.
Oil Water Separator		
Water is collecting in product tank	Oil water separator may not be level causing water to spill into the skimmer tube.	Check level of oil water separator and adjust if necessary.
	Skimmer tube is not adjusted properly.	Check position of skimmer tube ensure that tube is rotated so the skimming slot allows at least 1-2" of oil to collect before spilling over into the oil tank.
	Skimmer tube is cracked or leaking.	Check that skimmer tube is not cracked, replace if necessary.
	Separator can be full of sludge on the bottom restricting water flow through to the clean water reservour.	Check for dirt buildup in bottom. Drain and clean separator if necessary.

Oil is collecting on the clean water side	Oil water separator may be operating outside of design parameters.	Check that specific gravity of product and flow rate of separator match site-specific design print out for oil water separator. This can be found in the oil water separator section of your MLEE manual or submittal package.
	Oil water separator was not primed with clean water on startup and large amounts of product were initially pumped into separator contaminating the clean water sections.	Drain separator, clean separator and media, and fill with clean water before proceeding.
	Silt can build up in the bottom of the separator restricting volume capacity and flow through media.	Inspect bottom of separator and inside of media. Drain and clean separator and clean or replace media if plugged or restricted.
	Inlet side of separator can have excessive amounts of oil on the top layer. This will reduce effective capacity of oil water separator.	Check level of oil collected in inlet side of separator. Adjust skimmer if required. Re-prime separator so only 1-2" of product remains on the top of the separator.
	Biological bacteria is suspending product in high-density mucus like collections that are passing through the separator.	Check for signs of bacteria in the inlet side of the separator. Contact MLEE to discuss solutions to eliminating biological suspension.
	Product may be made up of two different components. The component breaking through may have a different density from what the separator was designed for.	Collect a sample of what is breaking through and confirm that it has the same properties as the product collecting on the inlet side.
	Oil storage tank may be fill and high-level alarm not working properly. This will back the product up and fill the inlet side of the separator with product until the product passes under the lower weir and collects in the clean-water side.	Check product storage tank and ensure that level switch is working properly and that tank has not overfilled.
Oil and water is building up on inlet side but is not passing through separator and collecting in the clean water side.	Sludge and dirt may have built up on floor of separator preventing the water from passing by the lower weir.	Check for dirt buildup on bottom of separator. Drain and clean if necessary.
	Oil Water interface may be too low indicating that the separator has insufficient water to properly separate.	Fill the separator with clean water allowing water to collect in the inlet side forcing the oil water interface level to rise up too about 1-2" below the skimmer level.
	Only product is being pumped into inlet of separator.	If water is not present in sample entering the separator then it will not collect in the clean water side.
Sand Filter		
Vessel is operating over pressure.	Sand filter may be full of dirt and silt.	Remove cover and check for dirt buildup on top of filter. Backwash filter.
	Equipment down stream of sand filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure	Check pressure output of pump with pump curve. Replace pump if required.
Filters are plugging too fast.	Filter was not backwashed properly.	Backwash filter vessel as per manufacturer's instructions.
	Filter pressure switch setpoint may be too low.	Increase high-pressure shutdown setpoint.
	Filter sand has solidified with calcification.	Replace sand in filter.
	Process water flow rate is operating above the design flow rate for the sand filter.	Check process flow rate and compare with design flow rate listed on manufacturer's literature or on the component sheet of the sand filter section of your Maple Leaf System Manual.
Rotary Screw Compressor Package		

Compressor not starting.	Motor Overload.	Reset overload. Check compressor output pressure. Oil separator may be dirty, replace if needed. Check supply voltage.
	Stopped by compressed air temperature relay.	Oil level is too low. Not enough cooling air flow. Wrong compressor oil. Ambient temperature too high. Cooler dirty.
Insufficient air output.	Clogged intake filter.	Check condition of the filter and replace if needed.
	Clogged oil separator element.	Check condition of the oil separator element and replace if needed.
	Pressure switch not working.	Check pressure switch adjustment. Repair or replace if switch is faulty.
	Receiver blow down valve open.	Disassemble and clean out internal components.
	Too high air consumption.	Check network for leaks and air powered devices.
	Drive belt slipping.	Check tension of belt and tighten if required. Replace belt if worn.
Compressor overheating.	Insufficient amount of oil.	Add more oil.
	Clogged oil filter.	Check condition of the filter and replace if needed.
	Cooler dirty.	Clean.
	Ambient temperature too high.	Check temperature and air circulation.
High oil consumption.	Oil return tube or its orifice is blocked.	Open and clean all internal components.
	Oil separator or sealing damaged or loosened.	Check seals and repair if needed.
	Oil separator dirty.	Replace.
	Wrong compressor oil.	Change oil. Use the correct oil as specified in the manufacturer's instructions.
	Output air temperature too high.	Check output temperature correct if it is too high.
	Faulty non-return valve of oil return pipe.	Check operation and replace valve if needed.
	Too much oil.	Drain extra oil out.
Network pressure rises over set valve.	Pressure switch not working or damaged.	Check operation of switch.
	Output valve leaking.	Replace seal.
	Loose wire connections.	Check for loose wires and correct as needed.
Compressor doesn't restart automatically.	Pressure switch damaged.	Replace pressure switch.
	Output valve leaks.	Replace seals of output valve.
	Loose wires.	Check for loose wires and correct as needed.
Compressor doesn't stop automatically.	Output valve leaks.	Replace seals of output valve.
	Pressure Switch Damaged.	Replace pressure switch.
Refrigerated Dryer		
Water down stream of dryer.	Residual air in piping.	Blow out system with dry air.
	Air bypass system is open.	Check bypass valve position.
	Inlet and Outlet conditions are reversed.	Check for correct connection.
	Air temperature on outlet of dryer may be too low.	Heat trace piping.

	Automatic drain mechanism is not working.	Replace drain mechanism.
	Dryer overloaded.	Check flow rate and inlet temperature.
High pressure drop across dryer.	Inlet air strainer clogged.	Clean inlet air strainer.
	Excessive air flow.	Check flow rate and reduce if needed.
	Separator filter clogged.	Replace filter sleeve.
	Freezing of moisture in evaporator.	
Fault Alarm.	Dryer overloaded resulting in high air outlet temperature.	Check operating conditions.
	High outlet air temperature.	Correct high temperature.
	Thermostat switch is malfunctioning or not securely mounted.	Replace thermostat switch.
Refrigeration system not functioning properly in on position.	Power failure.	Check power.
	Line disconnect switch open.	Check disconnect.
	Fuses blown, breaker blown.	Check fuses or breaker.
	Loose or faulty wiring.	Check wiring.
Refrigeration system cycles on and off.	High or low ambient conditions.	Check min/max temperature ranges.
	Air filter clogged.	Clean filter.
	Condenser fins clogged.	Clean fins.
	Fan motor or control switch not working.	Replace fan motor or switch.
Analog 4-20mA Transmitters		
Transmitter is sending a signal that is not accurate.	There may be water in the air sampling lines that is throwing off the readings.	Drain any moisture out of the air sampling lines.
	Transmitter may be out of calibration.	Refer to transmitter specification sheets on how to calibrate the transmitter. Note if transmitter is more than 10-25% out of calibration it will likely require factory recalibration.
Transmitter is sending 0-2 mA to the PLC input.	Transmitter may not be wired properly or one or more wire connections may be loose.	Check wiring with device specification sheet and MLEE drawing. Check wiring for loose connections.
	Transmitter may be damaged or not working properly.	If you have a similar transmitter installed in another location on the system, switch them around to determine if the faulty transmitter works in another location. If the transmitter works you know the transmitter is not the problem. If the transmitter does not work in the other location then it is likely the transmitter. If the good transmitter does not work in the faulty location the problem is likely the wiring at that location or the input into the PLC.
Transmitter is sending over 20 mA to the PLC.	Transmitter is likely damaged.	Send back to manufacturer for re-calibration.
PLC's		
Power is on, Lights are on but PLC is not running the logic. Run light is not on.	PLC may not be in run mode. If the power has been off to the panel for an extended period of time, the PLC will switch out of run mode and stop running the logic.	Use external switch on PLC to switch from "term" to "run" then back to "term". This will force the PLC back into run mode. The run light should now indicate that the PLC is in run mode.
Power is on to panel but PLC lights are not on.	Fuse for PLC is pulled out or blown.	Test PLC fuse and replace if necessary. This is in the "PLC" fuse holder.

APPENDIX I SVE System Parts List

Parts Listing per Maintenance Code

Blower, Rotary Lobe, Sutorbilt

	Part		Qty	Module
B-701	13889	Blower,Sutorbilt,Model 8L-RHC	1	Soil-Vapor Extraction
B-701	17478	Blower, Sutorbilt, 8M-D - 40-75hp, package	1	Soil-Vapor Extraction

Compressor, MI (Mink)

	Part		Qty	Module
C-3101	12459	Compressor, Air,HR5-8, 1800rpm,UL/CSA	1	Air Compressor

Feed Oiler, Electric

	Part		Qty	Module
700-Oil	17653	Oil-rite auto-oiler, assembly	1	Soil-Vapor Extraction

Feed Oiler, Gravity

	Part		Qty	Module
700-Oil	13905	Oiler, gravity feed A4215-4, remote mount	1	Soil-Vapor Extraction

Flow Meter, Pitot Tube

	Part		Qty	Module
PDI-701-702	13523	Flow Sensor, DS300-6"	2	Soil-Vapor Extraction
PDI-101-102	17000	Flow Sensor, DS300-3"	2	Vacuum Inlet Manifold
PDI-201-207	17000	Flow Sensor, DS300-3"	7	Vacuum Inlet Manifold - 2
PDI-101-102	17332	Flow Meter, Pitot Tube, 3"	2	Vacuum Inlet Manifold
PDI-201-207	17332	Flow Meter, Pitot Tube, 3"	7	Vacuum Inlet Manifold - 2
PDI-701-702	17334	Flow Meter, Pitot Tube, 6"	2	Soil-Vapor Extraction

Gauge, Magnehelic

	Part		Qty	Module
PDI-701-702	11249	Gauge,Magnehelic,2008,0-8"wc	2	Soil-Vapor Extraction
PDI-101-102	13607	Gauge,Magnehelic,2015,0-15"wc	2	Vacuum Inlet Manifold
PDI-201-207	13607	Gauge,Magnehelic,2015,0-15"wc	7	Vacuum Inlet Manifold - 2

Gauge, Pressure

	Part		Qty	Module
PI-3101	16204	Gauge,Pressure,0-200psi, Indumart,P16T2-FG-200	1	Air Compressor
PI-502	16631	Gauge,Pressure,0-100psi, Indumart,P16T2-FG-100	1	Vapor/Liquid Separator - 2
P-402	16631	Gauge,Pressure,0-100psi, Indumart,P16T2-FG-100	1	Vapor/Liquid Separator - 2
PI-704	M1293	Gauge,Pressure,0-60" wc ,Dry,J60"-WC,SS	1	Soil-Vapor Extraction

Gauge, Temperature

	Part		Qty	Module
TI-701	M1423	Gauge,Temp.,0-250F,WL31305	1	Soil-Vapor Extraction

Gauge, Vacuum

	Part		Qty	Module
PI-701-703	M1319	Gauge,Vacuum,60-0" wc ,Dry,J60"-0WC,SS,1/4"	3	Soil-Vapor Extraction
PI-501	M1319	Gauge,Vacuum,60-0" wc ,Dry,J60"-0WC,SS,1/4"	1	Vapor/Liquid Separator - 2
PI-401	M1319	Gauge,Vacuum,60-0" wc ,Dry,J60"-0WC,SS,1/4"	1	Vapor Liquid Separator

Pump, Discharge

	Part		Qty	Module
P-501	14811	Pump,Discharge,1ST1E5D4W,Goulds, 1 x 1 1/4	1	Vapor/Liquid Separator - 2
P-401	14811	Pump,Discharge,1ST1E5D4W,Goulds, 1 x 1 1/4	1	Vapor Liquid Separator

Regulator

	Part		Qty	Module
3100-Piping	M1449	Regulator Air, Parker Hannifin, 07E32A13A, 1/2"	1	Air Compressor

Switch, Level

	Part			Qty	Module
LSHHLSH,LS	M1101	Switch,Level,X-Proof, FlotecT	L6EPB-B-S-3-A	3	Vapor/Liquid Separator - 2
LSHH,LSH,LS	M1101	Switch,Level,X-Proof, FlotecT	L6EPB-B-S-3-A	3	Vapor Liquid Separator

Tank

	Part		Qty	Module
PST-5201/250	16992	Tank,Oil Storage,500 US Gal,UL 142,,Double Walled	2	Product Storage Tank

Vacuum Relief Valve

	Part		Qty	Module
700-Inlet	17298	Valve,Vacuum Relief,Kunkle,215V-H 2" in/out Set @ 14"HG	1	Soil-Vapor Extraction

Valve, Solenoid

	Part		Qty	Module
SV-701	13843	Valve,Solenoid,EF8262H22 120/60 ASCO	1	Soil-Vapor Extraction
SV-3101	16109	Valve,Solenoid,456 321U,Burkert,NC	1	Air Compressor
SV-3102	16109	Valve,Solenoid,456 321U,Burkert,NC	1	Air Compressor

Vapor Liquid Separator

	Part		Qty	Module
VLS-401	12629	Vapor Liquid Separator,240 Gallon,VLW240	1	Vapor Liquid Separator
VLS-501	12629	Vapor Liquid Separator,240 Gallon,VLW240	1	Vapor/Liquid Separator - 2

Vertical Level Switch (Almeg)

	Part		Qty	Module
LSHH-7901-7	12351	Switch,Level,Almeg,vertical, ATB3-48B	2	Building, Trailer or Skid
LSHH-5201-5	M1499	Switch,Level,Almeg,vertical, ATB3-48SS	2	Product Storage Tank

APPENDIX J

RTO Start Up Procedures

I. Operating Sequence

Step	Operator Action	Effects	Remarks
1.	Turn on high voltage power.	Switch the disconnect on the main control panel to the ON position.	Control panel is powered. Panel devices execute self-test routines.	
2.	Turn on and enable control power. Operator Display Message: "Control Power Off. Turn On Control Power."	Assure that no emergency stops are pushed in. Press the CONTROL RESET pushbutton.	The CONTROL POWER ON indication light will illuminate.	Any time the main disconnect for the control panel is shut-off or an emergency stop is pressed, control power is removed. Control power must then be reset by pressing the CONTROL POWER RESET pushbutton.
3.	System Reset. Operator Display Message: "Please Wait to Re-Start System." "Press Fault Reset to Enable System."	Press System Reset push-button on the Human Machine Interface (HMI).	After Reset, system Start button is enabled. System is ready for start-up.	Anytime system is powered up, Emergency Stop button is depressed (control power off) or the system goes through a shutdown sequence, the PLC will latch a system shutdown bit. This bit MUST be reset before further operation is allowed.

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I. Operating Sequence

Step	Operator Action	Effects	Remarks
4.	Start system. Operator Display Message: "Press System Start Button to Start System."	Press Start pushbutton on the Human Machine Interface (HMI).	The system will go through an auto-start-up sequence that starts fans, checks safeties and monitors pressures.	
5.	Start Combustion Fan. Operator Display Message: "Combustion Fan Started. Proving Airflow."	None. Automatic.	Combustion motor starter is engaged.	System waits for feedback signal from the auxiliary contact on the motor starter indicating that the motor is running.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
6.	Combustion Airflow Proving. PDSL244	None. Automatic.	Shortly after the fan is started, the combustion air-proving switch closes.	The system allows thirty (30) seconds for airflow to be built up to prove the switch. If the switch does not prove closed within the allotted time or if the switch was closed and unexpectedly opens, after forty (40) seconds the operator is alerted to this condition on the HMI. Please refer to alarm conditions and explanations of this sequence.
7.	Start system Fan. Operator Display Message: "System Fan Started. Proving Airflow."	None. Automatic.	After the combustion blower is started and airflow is proven, the PLC will close the run contact on the VFD for the system fan.	System waits for feedback signal from VFD indicating that the VFD is running.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
8.	System Airflow Proving. PDSL107A/B	None. Automatic.	Shortly after the system fan is accelerated to its minimum speed, the system low differential pressure switch closes to prove airflow. (PDSL107A/B)	The system allows thirty (30) seconds for airflow to be built up to prove this switch. If the switch does not prove closed within the allotted time or if the switch was closed and unexpectedly opens, the operator is alerted to this condition via the HMI. Please refer to alarm conditions and explanations of this sequence.
9.	Oxidizer Poppet Valve Switching. XV109 XV110	None. Automatic.	The Oxidizer poppet valves start cycling. The cycle time is adjustable through the HMI, within limits.	When the valves stop cycling, or the system fan is shut-off, they return to the fully extended position. Valves continue to cycle whenever the system fan is on. Once the poppet valves start cycling, their positions are monitored by the PLC.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
10.	Burner pre-ignition requirements check. ZSC401 ZSO400A ZSO400B PSL203 PDSH204 TSHH121B TSHH122B TSHH127B TSHH128B ZSC207 ZSC210 ZSC242 ZSC135	None. Automatic.	With the system and combustion fans on and proving switches closed, the controls check to assure that: a. The process inlet damper is closed and the fresh air dampers are opened. b. Gas pressure is within acceptable limits. c. The chamber and cold face high temperature limit controllers read safe temperature conditions. d. The gas train blocking valves and firing rate actuators are in safe positions. e. The Hot Gas Bypass damper is closed.	If any of the required conditions are not satisfied, burner lighting is prevented. The operator is alerted to which condition is not met via the message display.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
11. System Purge. TR2260	None. Automatic.	With the system and combustion fan running and the air proving switches made, air is passed through the system for two and half (2.5) minutes.	The system must but purged before the burner can be lit. But, if the chamber temperature remains above 1400°F with the hard wired limit string made, the burner can be shut off and turned on without a re-purge.
12. Burner Enable/ Disable Push-button. Operator Display Message: "Burner NOT Enabled. Press Burner Enable Button."	Operator presses "Burner Enable" button **if** the burner is not enabled. Burner can be enabled or disabled before this step. After a shutdown or if control power is shut off the burner will default to the ***enabled*** state.	At any time, while the system is running and the burner is on the operator can press the Burner Disable push-button to disable and shut-off the burner. By shutting off the burner and letting the system and combustion fan run, the system can be cooled to a point below the shut off temperature set point.	If the Burner Disable pushbutton is pressed, the system will hold without lighting the burner. System and combustion fans will continue to run and the message display will alert the operator to this condition. If the Burner Disable pushbutton is pressed, while the burner is lit, the burner will shut-off and system will hold with fans running and alert the operator to this condition. When the system is started the burner is automatically enabled.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
13.	Burner lighting. Operator Display Message: "Burner Enabled. Main Flame Not Yet Established." XV205 XV207 IT233 BE231 TCV210 TCV242	None. Automatic.	The burner controller circuit is enabled. The burner control carries out the following steps: a. Main fuel valves are opened. b. Burner ignition spark. c. Burner flame established. d. The burner air and gas firing rate actuators are released to modulate. *Note:* Prior to opening of main fuel valves, the firing rate valve is held closed.	 Fuel introduced to the burner. The spark igniter attempts to light the fuel. The ignition spark is turned off. The flame controller assures the flame stability. System will enter a ramp sequence until set point is reached. *Note*: Burner lighting steps are displayed on the separate flame control display on control panel.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
14.	System heating. Operator Display Message: "Burner On. Heating to Operating Temperature." "Burner On At Operating Temperature. System Ready in 600 Seconds." TIC124	None. Automatic.	The firing rate valve modulates to drive and hold the combustion chamber temperature to field adjustable set point. When the system is running in burner mode the temperature PID loop will modulate the gas actuator. System will ramp to set point at twelve degrees (12° F) per minute.	The heat energy moves through the oxidizer and surrounding metal, gradually elevating the oxidizer temperature. Loop control and tuning is via a single PID loop in the PLC controller and accessed through the HMI.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
15.	Oxidizer ready. Operator Display Message: "System Ready. Inlet May Be Opened." DO900	None. Automatic.	The oxidizer chamber temperature reaches the field adjustable system operating "ready" set point. The controls close normally open Ready relay contacts within the control panel to indicate the system is ready. These contacts are available for owner's use to indicate that the system is ready, to enable other necessary ancillary equipment.	Oxidizer ready temperature must be maintained in the oxidizer chamber continuously for several minutes before the controls acknowledge the oxidizer is ready. System heat-up rate is twelve degrees (12°F) per minute. System heat up period is generally 60 to 90 minutes. When the oxidizer is ready, the HMI notifies the operator and the system ready contacts (DO900), in the control panel, change states.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
16.	Place system on-line. Operator Display Message: "System On-Line. Inlet Open" XV401	When the inlet is enabled from the HMI, and the oxidizer has attained ready state (DO900), the inlet to the oxidizer system opens. The inlet may also be disabled from the HMI. In order for the inlet to open it MUST be enabled from the HMI, and the oxidizer must be at ready temperature. *Note*: The Inlet is defaulted on power down and startup conditions to the enabled state on the HMI.	The system being placed "on-line" is constituted by the process inlet damper being open and a feedback signal switch indicating this to the oxidizer control panel. When the process inlet damper switch indicates to the oxidizer controls that a process inlet damper is open, the fresh air dampers are released to modulate. The controls place the oxidizer in the "on-line" configuration.	The oxidizer assumes its "on-line" status only if the process inlet damper is open and the oxidizer is at the "ready" operating temperature. *Note*: The system inlet damper can be enabled by the HMI after the system has been started and before the system has attained ready temperature but the inlet will not open until the system has attained ready temperature.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
17. System Fan Speed Modulation. PIC101 VFD105	None. Automatic.	The control loop accommodates, within limits, varying process flow to the oxidizer.	A pressure transmitter located in the oxidizer inlet ductwork senses static pressure of the process line. The signal from the pressure transmitter is fed to the PLC. The output of the PLC controller sets the position of the fresh air dampers and the system fan speed, via the fan's controlling variable frequency drive. The pressure loop controller, by controlling the fresh air dampers and fan speed, maintains a field adjustable (within the limits of the pressure transmitter's measurement range) slightly negative pressure in the process stream. This provides the force to move the process stream through the system.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
18.	Fresh Air Damper Modulation. TIC124 PIC101 TCV400A TCV400B	None. Automatic.	The fresh air dampers (TCV400A/B) are modulated under two conditions: If the chamber temperature remains above the set point value, the fresh air dampers are modulated to add dilution air. AND/OR If the pressure at the collection plenum remains below the pressure set point value, the fresh air dampers are modulated to relieve the pressure.	When the system is placed on-line, this feature is automatically enabled. The fresh air dampers are controlled by both the temperature and pressure PID loops. Whichever PID loop calls for the fresh air to be opened more, controls the fresh air dampers. The other loop will compensate by firing the burner harder or speeding up the system fan depending on which loop is calling for the fresh air dampers to be modulated open.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
19.	Poppet Valve Cycle Time Extension.	None. Automatic.	If the chamber temperature rises above set point due to high VOC loading, the PLC will automatically increment the system poppet valve cycle timer. This will increase the time between scheduled valve switching and decrease the heat recovery efficiency of the system to handle higher loading.	When the system is placed on-line the poppet valve cycle time extension feature is automatically enabled.
20.	Poppet Valve Short Cycle. TE127A TE128A	None. Automatic.	The system monitors the cold face temperatures (TE127A & TE128A) and will short cycle the valves to avoid a high temperature condition. This function cannot be disabled and is active whenever the system fan is running. This function is meant to protect the equipment.	As stated in Step 9 of this sequence, the poppet valves will cycle at regular intervals except when the temperatures reach a predetermined high level.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
21.	Hot Gas Bypass Operation. TIC135 TCV135	None. Automatic.	As the chamber temperature rises, due to high loading, it will approach the set point. As the chamber temperature reaches this set point, the hot gas bypass damper will be modulated open to exhaust chamber heat directly to the stack.	A running average temperature is generated from the hotter of the two chamber thermocouples and is immediately averaged with the control temperature. This value is fed into the Hot Gas Bypass PID tuning block as the process variable.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
22.	Taking system off-line. Operator Display Message: "System Ready. Inlet May Be Opened." XV401	If the inlet is disabled through the HMI, the damper is closed and the system is taken off-line.	When the process inlet damper is no longer enabled the fresh air dampers are opened. The feedback signal from the process inlet controls to the oxidizer controls must indicate the process inlet is no longer open. The fan speed pressure loop control becomes inactive and fan speed is reduced to minimum setting. The oxidizer temperature control continues operating normally.	The oxidizer may be taken off-line and again placed on-line as often as necessary by the operator or process line. Every time the system is taken off-line it will assume the idle (fresh air inlets open) mode.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
23. Bake out. Operator Display Message: "Bake Out In Progress. Please Wait." "Baking Out Chamber #2. Please Wait." "Baking Out Chamber #1. Please Wait." TSL127A TSL128A	The operator starts the bake out procedure by pressing the Start Bake Out pushbutton on the HMI. The operator can cancel the bake out function by pressing the Bake Out Stop pushbutton on the HMI. *Note*: The bake out cold face temperature is ramped to set point at a rate of 50°F/minute.	If the system was on-line, it is taken off-line, the pressure loop, and dilution heating loop are disabled. The system finishes its scheduled system valve cycles. Bake out of Chamber #2 is started. The cold face temperature is raised to the bake out temp and held there (by short cycling the poppet dampers) for a predetermined amount of time. When Chamber #2 has completed its bake out, Chamber #1 is baked out. The cold face temperature is raised to the bake out temp and held there (by short cycling the poppet dampers) for a predetermined amount of time.	During a bake out, the system will hold the system valves in one position until the cold face temperature has reached the Bake Out Set Point (Please refer to Set Points and Alarm Conditions section of this document). When the bake out temperature is reached, a timer is started and the dampers will cycle momentarily in the opposite direction to maintain the bake out cold face temperature for the predetermined amount of time. The valves are then switched and the other chamber goes through Bake Out. The Bake Out Set Point and time duration are adjustable through the HMI. Depending on the bake out time, the amount of heat soak the beds have received and the amount of time it takes for the heat to move down through the chambers, bake out time will vary.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
24. System shut down. Operator Display Message: "System Shutting Down. Burner Will Shut Off After Post Burn." "System Shutdown. Cooling to Shutdown Temperature." DO900	Press the system STOP push-button on the HMI. *Note*: The operator is cautioned about stopping the system and required the operator to press the "System Stop" button a second time.	The oxidizer enters into the shutdown routine: a. The contact, (DO900) which indicates the system is ready for the process stream, opens. AND b. If the process inlet damper was open, it closes, and the fresh air dampers return to the full open position. AND c. If the burner is on when the STOP button is pressed, it is shut off. THEN	Operator interface indicates shutdown and burner and blower running status during shutdown procedure. *Note*: If the STOP button is pressed before the oxidizer start-up has been completed, specifically before the burner has been lit (and the system is below System Shutdown Temperature), then there is no need for a cool-down period. If the STOP button is pressed and the burner is not on, the combustion and system blowers stop immediately if the system temperature is below the System Shutdown Temperature. *Note*: At any time during the shutdown sequence, the system can be restarted by pressing the System Start button.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
24.	System shut down. Operator Display Message: "System Shutdown. Cooling to Shutdown Temperature." *(Continued)*	d. With the burners off, the controls maintain all fans on for an oxidizer cool down which continues until the oxidizer temperature cools to a system cool down temperature set point (adjustable through the HMI). THEN e. When this cooling period elapses, and shutdown temperature is reached the combustion and system fans are shut off. When the system fan shuts off the poppet valves return to their fully extended positions.	<u>*Note*</u>: The system temperature is monitored and fans will not shut off until shutdown temperature is reached.

I. Operating Sequence

Step	Operator Action	Effects	Remarks
25.	System shutdown completion. Operator Display Message: "Please Wait to Re-Start System." "Press Fault Reset Button to Enable System."	None. Automatic.	System shutdown bit is latched. Further system operation is prevented until RESET push-button is pressed. Operation is returned to Step 3 of system operation.	Anytime the system is powered up, Emergency Stop button is depressed (control power off) or the system goes through a shutdown sequence, the PLC will latch a system shutdown bit. This bit MUST be reset before further operation is allowed.
26.	Leak Test. Operator Display Message: "System In Leak Test Mode." HS220 XV205 XV207	Operator places the system in Leak Test mode with the selector switch on the main control panel.	The operator performs an NFPA approved leak test.	If the system was running when the Leak Test selector switch was switched to "Leak Test" from "Run", the system is shutdown immediately.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Key:		**Warning Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. The system takes no other action. **Off-Line Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated and the ready relay (CR4380/DO900) is de-energized. If the system inlet is open, it is closed. The system takes no other action. **Shutdown Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. The burner is shut off. The ready relay (CR4380/DO900) is de-energized and the system enters the shutdown sequence. See Item 24 in Operating Sequence section of this sequence. **Hard Shutdown Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. All PLC controlled devices are shutdown. This is similar to pressing an E-Stop pushbutton. **Set Point**: The value that is to be entered in the HMI, set in a controller or the value that a physical switch must be scaled/set to.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Temperature Set Point **Set Point**	1550°F TIC124	This is the temperature the firing rate actuator will modulate around and try to maintain. This set point is accessed through the HMI.
Hot Gas Bypass Temperature Set Point **Set Point**	Set Point = 1750°F TIC135	When the chamber temperature reaches this set point the hot gas bypass is modulated open to dump excess heat to the stack.
Pressure Set Point **Set Point**	-1.0" w.c. PIC101	When the system chamber ready and dilution air ready temperatures are made, this is the pressure the system VFD will modulate to try to maintain. This set point is accessed through the HMI.
System Ready Temperature **Set Point**	Set Point = TIC124.SP - 50°F TSL124	When the chamber and the dilution air reach their respective ready temperatures a ten (10) minute timer is started. When the ten (10) minute timer is complete the system is considered "Ready".
Chamber Ready Temperature Lost Alarm TAL124 **Off-Line Alarm**	Set Point = TIC124.SP - 100°F TSL124	Once the chamber has attained ready temperature (and is not in a shutdown sequence) the running average chamber temperature is monitored and if it ever falls below this set point, for more than five (5) minutes, this alarm is asserted. Additionally, if either chamber should fall below 1400°F, this alarm is asserted immediately.
System VFD Alarm XAO105A **Hard Shutdown Alarm**	XSO105A	The system VFD was given the run signal from the PLC and the VFD running contact did not close in the allotted amount of time or the VFD was running with the contact closed and the contact unexpectedly opened.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
System VFD Disconnect Alarm XAO105B **Hard Shutdown Alarm**	XSO105B	Control power is on and the system fan motor disconnect is not in the ON position.
System Low Differential Air Flow Alarm PDAL107 **Hard Shutdown Alarm**	Set Point = 1.0" w.c. PDSL107A PDSL107B	The system fan is running and the Low Differential Switch has not closed in the allotted time or the switch was closed and unexpectedly opens.
Total Poppet Switching Time **Set Point**	Set Point = 6 min	This is the total time for one complete cycle of the poppet valves (extending and retracting of both XV109 and XV110). This set point is accessed through the HMI. This set point is automatically adjusted by the poppet valve cycle time extension feature, in the PLC, when the system is on-line and the chamber temperature rises above set point or shortened in the condition of high cold face temperatures.
Combustion Motor Alarm XAO240A **Hard Shutdown Alarm**	XSO240A	The combustion motor starter was given the run signal by the PLC and the motor starter running contact to the PLC did not close in the allotted amount of time or the motor starter was on and the overload tripped and shut-off the starter.
Combustion Air Flow Switch Alarm PDAL244 **Hard Shutdown Alarm**	Set Point = 0.1" w.c. PDSL244	The combustion fan is running and the differential pressure switch from the fan to the combustion chamber has not proven or the switch had been closed and unexpectedly opened.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Inlet #1 Valve Positioning Alarm ZAC401 ZAO401 **Warning Alarm**	ZSC401 ZSO401	Any time the PLC calls for the inlet valve to be moved the PLC allows the dampers thirty (30) seconds to make position before this alarm is asserted.
Fresh Air Damper Position Alarm ZAO400A ZAO400B **Warning Alarm**	ZSO400A ZSO400B	The fresh air damper is required to be open and it has not proven open in the allotted amount of time.
Excess Negative Pressure Alarm PAL102 **Hard Shutdown Alarm**	Set Point = -9.0" w.c. PSL102	The negative pressure in front of the system fan has fallen below the setting of this monitoring switch. This alarm is asserted and the system is shutdown to protect the ductwork from collapsing.
Poppet Valve #1 Extend Positioning Alarm ZAO109 ZAC109 ZAO110 ZAC110 **Off-Line Alarm**	ZSO109 ZSC109 ZSO110 ZSC110	Each poppet valve is individually monitored for position while the system fan is running. If a valve fails to make position, the operator is alerted as to which valve did not make position and what position it did not make.
Low Fuel Pressure Alarm PAL203 **Hard Shutdown Alarm**	Set Point = 4.0" w.c. PSL203	The fuel pressure has fallen below the set point on the gas pressure switch. The set point is adjustable on the switch itself. These pressure switches are required safety devices and should NEVER be bypassed.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
High Fuel Pressure Alarm PDAH204 **Hard Shutdown Alarm**	Set Point = 3.0" w.c. PDSH204	The fuel pressure has risen above the set point on the gas pressure switch. The set point is adjustable on the switch itself. These pressure switches are required safety devices and should NEVER be bypassed.
Burner Flame Supervisor Alarm FAL235 **Shutdown Alarm**	FSC235	The flame safety relay has faulted. Please refer to the flame safety literature in your owner's manual for the specific fault code information. Flame safety relay information is displayed on the main control panel via the flame safety relay display module. The flame safety relay is a required safety device and should NEVER be bypassed.
High Chamber Limit Temperature Alarm TAHH121B TAHH122B **Hard Shutdown Alarm**	Set Point = 1800°F TSHH121B Or TSHH122B	The oxidizer temperature on TE121B or TE122B has risen above the set point in the high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.
High Chamber Temperature Alarm TAH121A TAH122A **Hard Shutdown Alarm** (Internal to the PLC)	Set Point = 1800°F TSH121A Or TSH122A	The oxidizer chamber temperature has risen above the set point in the PLC. This set point is adjustable through HMI. This set point should only be adjusted by qualified service personal.
Shutdown Temperature **Set Point**	Set Point = 800°F TIC124	This is the temperature the system will cool down to when a normal shutdown routine is run.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Loss of Plant Supplied Air Pressure Alarm PAL606 **Hard Shutdown Alarm**	Set Point = 70 psig PSL606	The pressure switch that monitors plant-supplied air has tripped, indicating loss of plant air. The system uses the air in the accumulator tanks to drive the dampers to the fully extended position.
System Inlet Low Pressure Alarm PAL101 **Warning Alarm**	Set Point = -6.0" w.c. PSL101	The pressure control loop for the system VFD is active and the process pressure has not attained acceptable limits. After a sixty (60) second delay, this alarm is asserted.
System Inlet High Pressure Alarm PAH101 **Warning Alarm**	Set Point = 0.0" w.c. PSH101	The pressure control loop for the system VFD is active and the process pressure has not attained acceptable limits. After a sixty (60) second delay, the system is taken off-line and an alarm is asserted.
Cold Face #1 or Cold Face # 2 High Temperature Alarm TAH127A TAH128A **Warning Alarm**	Set Point = 600°F TSH127A Or TSH128A	The thermocouple that monitors the cold face temperature is compared to the set point for Cold Face High Temperature. If the temperature is ever at or above this set point the system is shutdown. The set point is adjustable through the HMI.
Cold Face #1 or Cold Face #2 High Limit Temperature Alarm TAHH127B TAHH128B **Hard Shutdown Alarm**	Set Point = 600°F TSHH127B Or TSHH128B	The cold face air temperature on either TE127B or TE128B has risen above the set point in the corresponding high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Stack High Temperature Alarm TAH130A **Warning Alarm**	Set Point = 625°F TSH130A	The thermocouple that monitors the stack temperature is compared to the set point for Stack High Temperature. If the temperature is ever at or above this set point the system is shutdown. The set point is adjustable through the HMI.
Stack High Limit Temperature Alarm TAHH130B **Hard Shutdown Alarm**	Set Point = 625°F TSHH130B	The stack temperature on TE130B has risen above the set point in the high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.
Hot Gas Bypass Damper Position Alarm ZAC135 **Warning Alarm**	ZSC135	This valve MUST be proven closed to purge the oxidizer system.
Burner Main Blocking Valve Open Position Alarm ZAO205 **Hard Shutdown Alarm**	ZSO205	If the burner is not on and this valve is open, this alarm is asserted.
Burner Main Blocking Valve Closed Position Alarm ZAC207 **Warning Alarm**	ZSC207	When the system is purging, before the burner is lit, this valve MUST be proven closed.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Burner Gas Actuator Low Fire Position Alarm ZAC210 **Warning Alarm**	ZSC210	When the system is purging, before the burner is lit, this valve MUST be proven closed.
Burner Air Actuator Low Fire Position Alarm ZAC242 **Warning Alarm**	ZSC242	When the system is purging, before the burner is lit, this valve MUST be proven closed.
Cold Face Bake Out Temperature **Set Point**	Set Point = 500°F TSL127A TSL128A	When a bake out sequence is initiated the cold face for each chamber is raised to this temperature.
Cold Face Bake Out Time **Set Point**	Set Point = 30 Min TSL127A TSL128A	When a bake out sequence is initiated each cold face will be brought to bake out temperature for this amount of time. The poppet dampers are short cycled to maintain bake out temperature (± 10°F) for this amount of time.
Bake Out Ramp Rate **Set Point**	Set Point = 5-50°F/min.	When a bake out sequence is initiated each cold face will be brought up to temperature at a determined temperature rate.
Chamber Above Purge Temperature TALL121B TALL122B **Set Point**	Set Point = 1400°F TSLL121B TSLL122B	The chambers must remain above this temperature while the system is On-Line. If one or both chambers fall below this temperature the (hard wired contact) limit string will open, and the system will require a re-purge before the burners can be re-lit.

II. Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
System Fan is Running and Chart Recorder is NOT Recording Alarm. **Warning Alarm**		This alarm is asserted if the chart recorder is not recording data and the system fan is running. Check to assure that the Compact Flash media is present and the "Record" status light is on.
Maintenance Milestone Alarm **Warning Alarm**	4500 Hours of Run Time on Equipment	This alarm is triggered after every 4500 hours of run time to remind the maintenance department to perform or schedule maintenance for the equipment. This maintenance interval can only be changed through the PLC logic.

APPENDIX K

RTO Maintenance Schedule

MAINTENANCE RECOMMENDATIONS

Note: Complete records of all service work done on the unit should be documented and a record of said maintenance be kept at the unit and a copy in the main office. The records can help in troubleshooting the unit in the future. Anguil Environmental Systems Service Technicians are on call to help with any questions regarding procedures and configurations.

COMPONENT/PROBLEM	ACTION REQUIRED
System Fan/Blower	
Fan and Motor Bearing Lubrication	Follow blower and motor manufacturer's instructions.
Fan Wheel	Check and clean quarterly. If worn out or out of balance (excessive vibration) contact Anguil.
Air Proving Switch	Check for proper operation by increasing set point until the switch trips.
Inlet Filter (Combustion Fan)	Check every 1000 hours of operation. Clean or replace, if required.
Belt/Power Band	Inspect for proper belt tension monthly or 2-3 days after any belt replacement, as applicable to your specific unit. Tighten or replace as necessary, following manufacturer's instructions.
Controllers	
Configuration/ Calibration	Check and adjust quarterly.
	Check for proper air flow measurement/recording. Calibrate transmitter, as necessary.

COMPONENT/PROBLEM	ACTION REQUIRED
Burner	
UV Scanner / Spark Ignitor	Inspect UV scanner and spark ignitor quarterly. Clean if necessary, replace yearly.
	Have burner tuning checked yearly by Anguil or qualified Maxon Burner Technician. Technician should also check operation of burner assembly parts, such as the check valve, pilot regulator and pilot gas cock.
Fuel Train	
Shut Off Valve	Check main shut off valve for leakage semi-annually.
Pressure Switch	Check high and low gas pressure switches. Verify proper operation by adjusting set point up or down until the switch opens.
Gas Pressure	Verify that all gas pressures are within previously recorded parameters.
Firing Rate Valve/Actuator	Check operation of firing rate valve and actuator. Use controller manual mode to run it through its full stroke. Check linkage for binding, slippage, wear and corrosion. Replace, if necessary.

COMPONENT/PROBLEM	ACTION REQUIRED
General	
Nuts and Bolts	Quarterly inspect locations for tightness, as applicable to your specific unit. Tighten, as necessary.
Safety Review	
	A yearly safety review of the equipment should consist of a meeting with all operation and maintenance personnel to review hazards.
	Annual visit by trained Anguil Service Technician for check of system balance and control calibration is recommended.

APPENDIX L

General RTO Troubleshooting Guide

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Key:		**Warning Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. The system takes no other action. **Off-Line Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated and the ready relay (CR4380/DO900) is de-energized. If the system inlet is open, it is closed. The system takes no other action. **Shutdown Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. The burner is shut off. The ready relay (CR4380/DO900) is de-energized and the system enters the shutdown sequence. See Item 24 in Operating Sequence section of this sequence. **Hard Shutdown Alarm**: The alarm horn, alarm relay (CR4440) and alarm light are activated. All PLC controlled devices are shutdown. This is similar to pressing an E-Stop pushbutton. **Set Point**: The value that is to be entered in the HMI, set in a controller or the value that a physical switch must be scaled/set to.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Temperature Set Point **Set Point**	1550°F TIC124	This is the temperature the firing rate actuator will modulate around and try to maintain. This set point is accessed through the HMI.
Hot Gas Bypass Temperature Set Point **Set Point**	Set Point = 1750°F TIC135	When the chamber temperature reaches this set point the hot gas bypass is modulated open to dump excess heat to the stack.
Pressure Set Point **Set Point**	-1.0" w.c. PIC101	When the system chamber ready and dilution air ready temperatures are made, this is the pressure the system VFD will modulate to try to maintain. This set point is accessed through the HMI.
System Ready Temperature **Set Point**	Set Point = TIC124.SP - 50°F TSL124	When the chamber and the dilution air reach their respective ready temperatures a ten (10) minute timer is started. When the ten (10) minute timer is complete the system is considered "Ready".
Chamber Ready Temperature Lost Alarm TAL124 **Off-Line Alarm**	Set Point = TIC124.SP - 100°F TSL124	Once the chamber has attained ready temperature (and is not in a shutdown sequence) the running average chamber temperature is monitored and if it ever falls below this set point, for more than five (5) minutes, this alarm is asserted. Additionally, if either chamber should fall below 1400°F, this alarm is asserted immediately.
System VFD Alarm XAO105A **Hard Shutdown Alarm**	XSO105A	The system VFD was given the run signal from the PLC and the VFD running contact did not close in the allotted amount of time or the VFD was running with the contact closed and the contact unexpectedly opened.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
System VFD Disconnect Alarm XAO105B **Hard Shutdown Alarm**	XSO105B	Control power is on and the system fan motor disconnect is not in the ON position.
System Low Differential Air Flow Alarm PDAL107 **Hard Shutdown Alarm**	Set Point = 1.0" w.c. PDSL107A PDSL107B	The system fan is running and the Low Differential Switch has not closed in the allotted time or the switch was closed and unexpectedly opens.
Total Poppet Switching Time **Set Point**	Set Point = 6 min	This is the total time for one complete cycle of the poppet valves (extending and retracting of both XV109 and XV110). This set point is accessed through the HMI. This set point is automatically adjusted by the poppet valve cycle time extension feature, in the PLC, when the system is on-line and the chamber temperature rises above set point or shortened in the condition of high cold face temperatures.
Combustion Motor Alarm XAO240A **Hard Shutdown Alarm**	XSO240A	The combustion motor starter was given the run signal by the PLC and the motor starter running contact to the PLC did not close in the allotted amount of time or the motor starter was on and the overload tripped and shut-off the starter.
Combustion Air Flow Switch Alarm PDAL244 **Hard Shutdown Alarm**	Set Point = 0.1" w.c. PDSL244	The combustion fan is running and the differential pressure switch from the fan to the combustion chamber has not proven or the switch had been closed and unexpectedly opened.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Inlet #1 Valve Positioning Alarm ZAC701 **Warning Alarm**	ZSC701	Any time the PLC calls for the inlet valve to be moved the PLC allows the dampers thirty (30) seconds to make position before this alarm is asserted.
Fresh Air Damper Position Alarm ZAO400A ZAO400B **Warning Alarm**	ZSO400A ZSO400B	The fresh air damper is required to be open and it has not proven open in the allotted amount of time.
Excess Negative Pressure Alarm PAL102 **Hard Shutdown Alarm**	Set Point = -9.0" w.c. PSL102	The negative pressure in front of the system fan has fallen below the setting of this monitoring switch. This alarm is asserted and the system is shutdown to protect the ductwork from collapsing.
Poppet Valve #1 Extend Positioning Alarm ZAO109 ZAC109 ZAO110 ZAC110 **Off-Line Alarm**	ZSO109 ZSC109 ZSO110 ZSC110	Each poppet valve is individually monitored for position while the system fan is running. If a valve fails to make position, the operator is alerted as to which valve did not make position and what position it did not make.
Low Fuel Pressure Alarm PAL203 **Hard Shutdown Alarm**	Set Point = 4.0" w.c. PSL203	The fuel pressure has fallen below the set point on the gas pressure switch. The set point is adjustable on the switch itself. These pressure switches are required safety devices and should NEVER be bypassed.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
High Fuel Pressure Alarm PDAH204 **Hard Shutdown Alarm**	Set Point = 3.0" w.c. PDSH204	The fuel pressure has risen above the set point on the gas pressure switch. The set point is adjustable on the switch itself. These pressure switches are required safety devices and should NEVER be bypassed.
Burner Flame Supervisor Alarm FAL235 **Shutdown Alarm**	FSC235	The flame safety relay has faulted. Please refer to the flame safety literature in your owner's manual for the specific fault code information. Flame safety relay information is displayed on the main control panel via the flame safety relay display module. The flame safety relay is a required safety device and should NEVER be bypassed.
High Chamber Limit Temperature Alarm TAHH121B TAHH122B **Hard Shutdown Alarm**	Set Point = 1800°F TSHH121B Or TSHH122B	The oxidizer temperature on TE121B or TE122B has risen above the set point in the high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.
High Chamber Temperature Alarm TAH121A TAH122A **Hard Shutdown Alarm** (Internal to the PLC)	Set Point = 1800°F TSH121A Or TSH122A	The oxidizer chamber temperature has risen above the set point in the PLC. This set point is adjustable through HMI. This set point should only be adjusted by qualified service personal.
Shutdown Temperature **Set Point**	Set Point = 800°F TIC124	This is the temperature the system will cool down to when a normal shutdown routine is run.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Loss of Plant Supplied Air Pressure Alarm PAL606 **Hard Shutdown Alarm**	Set Point = 70 psig PSL606	The pressure switch that monitors plant-supplied air has tripped, indicating loss of plant air. The system uses the air in the accumulator tanks to drive the dampers to the fully extended position.
System Inlet Low Pressure Alarm PAL101 **Warning Alarm**	Set Point = -6.0" w.c. PSL101	The pressure control loop for the system VFD is active and the process pressure has not attained acceptable limits. After a sixty (60) second delay, this alarm is asserted.
System Inlet High Pressure Alarm PAH101 **Warning Alarm**	Set Point = 0.0" w.c. PSH101	The pressure control loop for the system VFD is active and the process pressure has not attained acceptable limits. After a sixty (60) second delay, the system is taken off-line and an alarm is asserted.
Cold Face #1 or Cold Face # 2 High Temperature Alarm TAH127A TAH128A **Warning Alarm**	Set Point = 600°F TSH127A Or TSH128A	The thermocouple that monitors the cold face temperature is compared to the set point for Cold Face High Temperature. If the temperature is ever at or above this set point the system is shutdown. The set point is adjustable through the HMI.
Cold Face #1 or Cold Face #2 High Limit Temperature Alarm TAHH127B TAHH128B **Hard Shutdown Alarm**	Set Point = 600°F TSHH127B Or TSHH128B	The cold face air temperature on either TE127B or TE128B has risen above the set point in the corresponding high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Stack High Temperature Alarm TAH130A **Warning Alarm**	Set Point = 625°F TSH130A	The thermocouple that monitors the stack temperature is compared to the set point for Stack High Temperature. If the temperature is ever at or above this set point the system is shutdown. The set point is adjustable through the HMI.
Stack High Limit Temperature Alarm TAHH130B **Hard Shutdown Alarm**	Set Point = 625°F TSHH130B	The stack temperature on TE130B has risen above the set point in the high limit controller. Temperature high limit controllers are required safety devices and should NEVER be bypassed.
Hot Gas Bypass Damper Position Alarm ZAC135 **Warning Alarm**	ZSC135	This valve MUST be proven closed to purge the oxidizer system.
Burner Main Blocking Valve Open Position Alarm ZAO205 **Hard Shutdown Alarm**	ZSO205	If the burner is not on and this valve is open, this alarm is asserted.
Burner Main Blocking Valve Closed Position Alarm ZAC207 **Warning Alarm**	ZSC207	When the system is purging, before the burner is lit, this valve MUST be proven closed.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
Burner Gas Actuator Low Fire Position Alarm ZAC210 **Warning Alarm**	ZSC210	When the system is purging, before the burner is lit, this valve MUST be proven closed.
Burner Air Actuator Low Fire Position Alarm ZAC242 **Warning Alarm**	ZSC242	When the system is purging, before the burner is lit, this valve MUST be proven closed.
Cold Face Bake Out Temperature **Set Point**	Set Point = 500°F TSL127A TSL128A	When a bake out sequence is initiated the cold face for each chamber is raised to this temperature.
Cold Face Bake Out Time **Set Point**	Set Point = 30 Min TSL127A TSL128A	When a bake out sequence is initiated each cold face will be brought to bake out temperature for this amount of time. The poppet dampers are short cycled to maintain bake out temperature (± 10°F) for this amount of time.
Bake Out Ramp Rate **Set Point**	Set Point = 5-50°F/min.	When a bake out sequence is initiated each cold face will be brought up to temperature at a determined temperature rate.
Chamber Above Purge Temperature TALL121B TALL122B **Set Point**	Set Point = 1400°F TSLL121B TSLL122B	The chambers must remain above this temperature while the system is On-Line. If one or both chambers fall below this temperature the (hard wired contact) limit string will open, and the system will require a re-purge before the burners can be re-lit.

Set Points and Alarm Conditions

Process Set Point or Alarm Condition	Value or Trip Condition	Explanation
System Fan is Running and Chart Recorder is NOT Recording Alarm. **Warning Alarm**		This alarm is asserted if the chart recorder is not recording data and the system fan is running. Check to assure that the Compact Flash media is present and the "Record" status light is on.
Maintenance Milestone Alarm **Warning Alarm**	4500 Hours of Run Time on Equipment	This alarm is triggered after every 4500 hours of run time to remind the maintenance department to perform or schedule maintenance for the equipment. This maintenance interval can only be changed through the PLC logic.

APPENDIX M

RTO Parts List

SEE ENCLOSED CD FOR BULLETIN

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	BURNER ASSEMBLY		
Actuator, Burner Fuel Firing Rate Valve TCV-210	Honeywell M7284C1000	AC 013	63-2640
Burner, 4" B-295	Maxon Kinemax-4 Series G	BU 023	3-11.4 3-11.4-10
Gas Switch, High Pressure 1.5-30" w.c. PDSH-204	Ashcroft AC D424B-XFM-30IN H20	SW 260	10007 Spec 221
Gas Valve, Burner Firing Rate 1½" TCV-210	Eclipse 6BV-ARB 501233	VA 033	720
Peepsight, 3"	Eclipse 120060	PE 003	865

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	SYSTEM FAN ASSEMBLY		
Actuator, Dilution Air TCV-400A/B	Honeywell M7285C1009	AC 007	63-2640
Damper, Dilution Air 14" TCV-400A/B	Vent Products 5311-99	DA 074	5310B / 1701A
Fan, System 50 hp with Teco Westinghouse motor F-101 & MTR-105	Twin City Fan Size 917 RBA Model NP0504	- -	BF458436-001-00 458436-1 ES-52 O&M 410-96
Switch, Excess Negative Pressure 3-11" w.c. PSL-102	Dwyer 1950-10-2F	SW 026	E-57 / E-50 / Spec
Transmitter, Pressure ±10" w. c. PT-101	Yokogawa EJA110A-EMS3B-72NC/FF/D1	TA 144	IM01C22A01E-A IM01C21B01E-A

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	COMBUSTION FAN ASSEMBLY		
Actuator, Combustion Air Firing Rate Valve TCV-242	Honeywell M7284C1000	AC 013	63-2640
Fan, Combustion 3 hp with Teco Westinghouse motor F-102 & MTR-240	Twin City Fan TBNA Size 19N4 Model EP0032	- -	BF458436-002-00 458436-2 ES-52 O&M 410-96
Filter, Inline Air 4" with wire mesh element	Universal CCS-4	FI 032	242-C / CCS-4 94-1341
Switch, Combustion Air Differential Pressure 0.07-0.15" w.c. PDSL-244	Dwyer 1950-00-2F	SW 014	E-57 / E-50 / Spec
Valve, Combustion Air Firing Rate 4" TCV-242	Eclipse 16BV-ARB 501237	VA 107	720

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	CONTROLS		
Controller, Chamber #1 High Limit Temperature TSHH-121B & TSLL-121B	Barber Colman 07SL-91113-000-0-00	CO 061	1262-IN-023-0-02
Controller, Chamber #2 High Limit Temperature TSHH-122B & TSLL-122B	Barber Colman 07SL-91113-000-0-00	CO 061	1262-IN-023-0-02
Controller, Cold Face #1 High Limit Temperature TSHH-127B	Barber Colman 07SL-91113-000-0-00	CO 061	1262-IN-023-0-02
Controller, Cold Face #2 High Limit Temperature TSHH-128B	Barber Colman 07SL-91113-000-0-00	CO 061	1262-IN-023-0-02
Controller, Cold Face #2 High Limit Temperature TSHH-130B	Barber Colman 07SL-91113-000-0-00	CO 061	1262-IN-023-0-02
CHART RECORDER			
Chart Recorder, Digital	Yokogawa MW100-E-1W-M1	CH 104	IM MW100-17E 030 IM MW100-01E 030 IM MW100-02E 030 IM MW180-01E 030 Enclosed CDs

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
VFD			
Variable Frequency Drive, 50 hp VFD-105	Square D Altivar ATV61HD37N4	VD6050	1757395-05
PLC			
Controller, Programmable Logic, Display Panelview Plus 1000	Allen Bradley 2711PC-T10C4D1	PL 214	2711PC-UM001A-EN-P
Controller, Programmable Logic, Ethernet Modem	Allen Bradley 9300- RADES	PL 081	Technical Manual Quick Start GMSC10-UM004A-EN-E
Controller, Programmable Logic, CompactLogix with Power Supply 16 Point Input Module 16 Point Output Module	Allen Bradley 1769-L32E 1769-PA4 1769-IA16 1769-OW16	PL 161 PL 155 PL 058 PL 151	1769-UM011F-EN-P
Controller, Programmable Logic, 8 Channel Analog Output Card	Allen Bradley 1769-OF8C	PL 170	1769-UM002B-EN-P
Controller, Programmable Logic, 2 Channel Thermocouple Universal Analog Input Module	Spectrum Controls 1769SC-IF8U	PL 271	0300198-02B

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
FLAME SAFETY			
Flame Control Amplifier	Fireye MEUVS4	AM 006	MAMP-1
Flame Control Display Module	Fireye ED510	DS 005	ED-5101
Flame Control, Ultra Violet Scanner BE-231	Fireye 45UV5-1009	UV 005	SC-101
Flame Supervisor Control Relay Module	Fireye Microm MEC120RD	CO 045	MC-5000
Thermocouple, 24" dual TE-121, TE-122, TE-127 & TE-128	Pyromation KK63U024-00-8HN31-LOGO/335	TC 070	rc-10
Thermocouple, 18" dual TE-130	Pyromation KK43U018-00-8HN31-LOGO/335	TC 086	rc-10
Timer, Purge Programmable	Fireye Microm MEP104	TI 013	MP-5101
Transformer, Ignition IT-233	Dongan A06-SA6	TR 011	90 / IO-706

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	FUEL TRAIN		
MAIN LINE 1-1/2"			
Actuator, Block Valve XV-205	Asco AH2E112A2	AC 060	V8860R1 / 390
Actuator, Block Valve XV-207	Asco AH2E112S2	AC 061	V8860R1 / 390
Gas Pressure Gauge, 2½" 0-15 psi PI-201A	Wika Instruments 9691982	GA 020	213.53 / Spec
Gas Pressure Gauge, 2½" 0-60" w.c. PI-201B	Wika Instruments 9747758	GA 018	611.10 / Spec
Gas Regulator, Main 1½" 1-2" psig PCV-202	Equimeter 243-12-1	RE 008	R-1306 Rev. 10 RM1306-1 Rev. 11
Gas Regulator, Balancing 1½" 5-15" w.c. PCV-208	Maxitrol 210D	RE 074	GPR210_MS_092008
Gas Switch, Low Differential Pressure 0-3" w.c. PSL-203	Ashcroft AC B424B-XFM-30IN WC	SW 250	SW10-B Spec 211

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
Gas Valve, Safety Shutoff 1½" XV-205	Asco V710HBS	VA 427	V9566 / 341
Gas Valve, Safety Shutoff 1½" XV-207	Asco V710HBSV22	VA 428	V9566 / 341
Gas, Y-Strainer 1½"	Keckley Style B 011-2030K	SR 039	Y2-Y3
Timer, Reset	ATC 405A500F1X	- -	22
	POPPET VALVE ASSEMBLY		
Valve, Poppet 28" Disk with Pneumatic Cylinders Switch, Proximity Valve, Solenoid	 Schrader Bellows PAF122442 Allen Bradley 871TM-BH15N30-A2 Parker L7058380253	 CY 005 SW 045 VA 220	 IOM / SB080.01T1 871TM-UM001A-EN-P 45, 56-57
	COMPRESSED AIR LINE		
Compressed Air Line Assy with Filter, Compressed Air ¾" Gauge, Pressure 0-160 psi Switch, Pressure 0-200 psig Lubricator, ¾"	 Parker 07F46AC Wika 9767070 Ashcroft AC B424B-X06-200# Parker 17L42BE	 FI 023 GA 008 SW 262 LU 003	 12,13 213.53 SW211 / Spec 211 86,87

COMPONENT / TAG NUMBER	MANUFACTURER NUMBER	AES PART NUMBER	VENDOR BULLETIN NUMBER
	MEDIA		
Heat Recovery Media, Ceramic Structured	Lantec MLM-180	MD 001	MLM MLM Install MLM Brochure
Heat Recovery Media, 1½" Ceramic Saddles	Lexco	MD 024	MSDS Saddles
	OTHER COMPONENTS		
Damper Assembly, Refractory 18" with Actuator Positioner Filter/Regulator TCV-135	Kelair BRI-M-7534 Remote Control RCI 460-SR5-LT Siemens/Moore 760EG-B-2M Fairchild 63252NS	DA 154	BRI-0-3921-1B Rev A Spec IMI/Spec/99-20062A SD760 IS-10000063 / Spec
Switch, System Differential Pressure Low 0.4-1.6" w.c. PDSL-107A/B	Dwyer 1950-1-2F	SW 006	E-57 / E-50 / Spec

APPENDIX N SVE Standard Operating Procedures (SOPs)

Number	Title
SOP No. 48	Soil Vapor Extraction Well Data Collection and Sampling
SOP No. 49	SVE Effectiveness Monitoring at Vapor Monitoring Points
SOP No. 52	Soil Vapor Field Laboratory Screening
SOP No. 53	Dwyer Digital Manometer
SOP No. 4	Equipment Decontamination
SOP No. 3	Calibration and Maintenance of Field Instruments

1. Objective

This document defines the standard operating procedure for calibration and maintenance of field instruments frequently used during environmental field activities. This Standard Operating Procedure (SOP) gives descriptions of the most common used of these instruments and field procedures necessary to calibrate and maintain these field instruments. Calibration and maintenance records for all equipment are maintained with the project file.

2. Equipment

The following equipment is required during field instrument calibration and maintenance activities.

- Latex/Nitrile gloves
- Site logbook
- Field data sheets
- Equipment Calibration Record forms
- Distilled/deionized water
- Decontamination equipment
- Health and Safety Equipment
- Field Instrument Operations Manual
- Calibration gases for Air Monitoring Equipment
- Calibration solutions for Water Monitoring Equipment.

3. Types of Field Instruments Commonly used during Environmental Investigations

The following are some of the more commonly used instruments during environmental investigations.

- Photoionization Detector (PID)
- Flame Ionization Detector (FID)
- Multi-gas Meter (usually includes Explosimeter, Hydrogen Sulfide detector, Oxygen sensor, and Carbon Monoxide meter)
- Single-gas Meter (usually Benzene or Hydrogen Sulfide meters)
- Groundwater Level Indicator

- Petroleum/Groundwater Interface Probe
- Groundwater pH, Temperature, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential and/or Turbidity Meter(s).

4. Maintenance

Maintenance should be performed on all field instruments on a regular basis to ensure instruments are in proper working order at all times and to prolong the instrument life. General maintenance such as regular cleaning of the instrument, battery checks and replacement, and ensuring the instrument is handled and stored properly can easily be performed by URS employees. Other maintenance items such as sensor repair, annual calibrations and repair of a malfunctioning piece of equipment should be performed by the instrument manufacturer or licensed dealer and should NOT be performed by URS employees. Contact the manufacturer to determine where the instrument should be submitted for these maintenance tasks. The vast range of instruments available for use by the environmental professional have an equally vast maintenance regime and therefore maintenance guidelines specified in the manual for each piece of equipment should be referred to and followed at all times.

5. Calibration

Due to the vast number of field instruments available, various parameters potentially monitored, and the wide range of functions potentially performed by each instrument, a description of the calibration of every type of instrument available is not feasible. However, a generalized SOP for general types of field equipment calibration is presented and should be followed while performing calibrations of field instruments.

Air Monitoring Instruments (PID, FID, Multi-gas Meters, Single-gas meters, etc.)

1. Turn the instrument on. The on/off switch may be a toggle switch, knob, or button to be depressed depending on the type and brand of instrument being used.
2. Allow the instrument to "warm up" and progress through the startup diagnostic routine.
3. Perform a "fresh air" calibration, if possible, for the air meter.
4. Record the initial reading on the proper equipment calibration field form and in the site logbook. Also record the fresh air calibration standard on the field form and in the logbook.

5. Apply the proper calibration gas and proceed with calibration as directed in the operator's manual.
6. Record the final calibrated reading on the field equipment calibration forms and in the field logbook.
7. At periodic intervals throughout the day the calibration of the instrument should be check and re-evaluated.

Groundwater Parameter Instruments (pH, Temperature, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential, Turbidity, etc.)

Frequently one instrument will have multiple sensors for measuring various parameters in water. With the exception of temperature, each of these parameters can generally be field calibrated.

1. Turn the instrument on. The on/off switch may be a toggle switch, knob, or button to be depressed depending on the type and brand of instrument being used.
2. Allow the instrument to "warm up" and progress through the startup diagnostic routine.
3. Apply calibration solution(s) as instructed by the instrument prompts and/or the operator's manual.
4. Adjust the reading of the instrument to correlate to the corresponding calibration solution being applied.
5. Record calibration reading(s) in the field logbook and on proper field calibration forms.
6. Dispose of used calibration solution and reseal calibration solution containers for future use.

Water Level Indicator and Petroleum/Water Interface Probe

Field calibration of this instrument is not required. Rather a series of field checks to ensure the instrument is in proper working order will be described.

1. Turn the instrument on. The on/off switch is usually a knob located on the side of the reel in which the measuring tape is rolled onto.
2. Push the "test" button to ensure that the batteries are in working order. If the batteries are working, an audible tone will be heard and a visible light located on the side of the real will illuminate.

3. Immerse the sensor probe in potable water to ensure the audible tone is heard and visible light illuminates when the electrical circuit is completed when the probe enters the water. Make an observation of where the water level is at on the probe when the circuit is completed. Repeat this step several times to familiarize yourself with this contact point. By performing this step, the chance of submersing the probe to a greater depth than necessary is reduced. Over submersion of the probe will result in a greater amount of the probe and measuring tape to be cleaned and decontaminated prior to collection of another groundwater measurement.

6. Decontamination

Small instruments and equipment that comes into contact with environmental media will be cleaned according to SOP No. 4 – Decontamination between each use, and will be stored in such a way as to prevent contamination.

1. Objective

This document defines the standard procedure for decontamination. This SOP serves as a supplement to the project Work/O&M/Field Sampling Plans and is intended to be used together with several other SOPs.

The overall objective of multimedia sampling programs is to obtain samples that accurately depict the chemical, physical, and/or biological conditions at the sampling site. Extraneous contaminants can be brought onto the sampling location and/or introduced into the medium of interest during the sampling program (e.g. using sampling equipment that is not properly or fully decontaminated). Trace quantities of contaminants can consequently be captured in a sample and lead to false positive analytical results and, ultimately, to an incorrect assessment of the contaminant conditions associated with the site. Decontamination of sampling equipment (e.g., all non-disposable equipment that will come in direct contact with samples) and field support equipment (e.g., drill rigs, vehicles) is, therefore, required prior to, between, and after uses to ensure that sampling cross-contamination is prevented, and that on-site contaminants are not carried off-site.

2. Equipment

The following is a list of equipment that may be needed to perform decontamination:

- Brushes
- Wash tubs
- Buckets
- Scrapers, flat bladed
- Hot water - high-pressure sprayer
- Sponges or paper towels
- Alconox/Liquinox detergent (or equivalent)
- Isopropyl alcohol
- Potable tap water
- Deionized or distilled water
- Garden-type water sprayers.
- Plastic sheeting or trash bags

3. Decontamination Procedures

3.1 Personnel

A temporary personnel decontamination line will be set up around each exclusion zone. If contamination is not encountered, a dry decontamination station may be established which consists of discarding of disposable personal protective equipment (PPE).

If real-time monitoring instruments indicate that contamination has been encountered (i.e. action levels are exceeded requiring an upgrade from initial PPE levels), a complete personnel decontamination station will be established.

The temporary decontamination line should provide space to wash and rinse boots, gloves, and all sampling or measuring equipment prior to placing the equipment into a vehicle. A container should be available to dispose of used disposable items such as gloves, tape, or tyvek (if used).

The decontamination procedure for field personnel will include:

1. Glove and boot wash in an Liquinox (or similar) solution
2. Glove and boot rinse
3. Duct tape removal
4. Outer glove removal
5. Coverall removal
6. Respirator removal (if used)
7. Inner glove removal

3.2 Sampling Equipment

The following steps will be used to decontaminate sampling equipment:

1. Personnel will dress in suitable safety PPE to reduce personal exposure as required by the HASP.
2. Gross contamination on equipment will be scraped off at the sampling or construction site.
3. Equipment will be sprayed and/or wiped off with isopropyl alcohol.
4. Equipment that cannot be damaged by liquid or water will be placed in a wash tub or bucket containing Liquinox or similar along with potable or distilled water and

scrubbed with a bristle brush or similar utensil (pumps will be turned on in order to circulate water through).

5. Equipment that cannot be damaged by liquid or water will then be rinsed with distilled water in a second wash tub or bucket.
6. Equipment that may be damaged by liquid/water will be carefully wiped clean using a sponge/paper towel with isopropyl alcohol, followed by a sponge/paper towel with detergent water and a sponge/paper towel with deionized or distilled water. Care will be taken to prevent equipment damage.
7. Rinse water and detergent water will be replaced with new solutions periodically throughout the day, at least at mid-day.

Following decontamination, equipment will be placed in a clean area or on clean plastic sheeting to prevent contact with contaminated media. If the equipment is not used immediately after decontamination, the equipment will be stored in such a way as to minimize potential contact with contaminants.

3.3 Water Level / Interface Probes

The following steps will be used to decontaminate water level meters and water/product interface probes:

1. Personnel will dress in suitable safety PPE to reduce personal exposure as required by the HASP.
2. Paper towel or other disposable media will be saturated with isopropyl alcohol.
3. Measuring tape and probe will be wiped clean as removed from the monitoring well where gauging activities are being performed by passing through the disposable media saturated with isopropyl alcohol.
4. Care will be taken to replace saturated paper towel if gross contamination is observed or it becomes dry during the process.
5. Probe tip will also be sprayed off with isopropyl alcohol, Liquinox (or similar) soapy water solution, and distilled water after wiping.

Following decontamination, equipment will be placed in a clean area or on clean plastic sheeting to prevent potential contact with contaminants.

3.4 Drilling and Heavy Equipment

Drilling rigs will be decontaminated at a decontamination station located near a central staging area. The decontamination station may consist of a temporary or permanent structure capable of collecting all decontamination fluids. Mobile decontamination trailers may be used to decontaminate heavy equipment at each site. The following steps will be used to decontaminate drilling and heavy equipment:

1. Review JSA for drilling and heavy equipment decontamination.
2. Personnel will dress in suitable PPE to reduce personal exposure as required by the HASP.
3. Equipment showing gross contamination or having caked-on drill cuttings will be scraped with a flat-bladed scraper at the sampling or construction site.
4. Equipment that cannot be damaged by water, such as drill rigs, augers, drill bits, and shovels, will be washed with a hot water, high-pressure sprayer then rinsed with potable water. Care will be taken to adequately clean the insides of the hollow-stem augers, backhoe buckets, etc.

Following decontamination, drilling equipment will be placed on the clean drill rig and moved to a clean area. If the equipment is not used immediately, it should be stored in a designated clean area.

3.5 Equipment Leaving the Site

Vehicles used for activities in non-contaminated areas shall be cleaned on an as-needed basis, as determined by the Site Safety Officer, using soap and water on the outside and vacuuming the inside. On-site cleaning will be required for very dirty vehicles leaving the area. Construction equipment such as trucks, drilling rigs, backhoes, trailers, etc., will be pressure washed before the equipment is removed from the site to limit exposure of off-site personnel to potential contaminants.

3.6 Wastewater

Liquid waste water from decontamination activities will be containerized and left at the site where it originated, unless otherwise specified. Check the project/task work plan or with the Shell IDW Coordinator for additional information/guidance.

4. Documentation

Sampling personnel will be responsible for documenting the decontamination of sampling and drilling equipment. The documentation will be recorded with waterproof ink in the sampler's field notebook with consecutively numbered pages. The information entered in the field book concerning decontamination should include the following:

- Decontamination personnel
- Date and start and end times
- Decontamination observations
- Weather conditions.

5. Quality Assurance Requirements

Equipment rinsate samples of the decontaminated sampling equipment may be taken to verify the effectiveness of the decontamination procedures. The rinsate sampling procedure will include rinsing deionized water through or over a decontaminated sampling tool (such as a split spoon) and collecting the rinsate water into the appropriate sample bottles. The rinsate sampling procedure, including the sample number, will be recorded in the field notebook.

1. Objective

The purpose of this Standard Operating Procedure (SOP) is to provide a consistent methodology for data and soil vapor sample collection related to the Roxana soil vapor extraction (SVE) remediation system. This SOP is applicable to:

- Collecting data from and sampling Roxana Soil Vapor Extraction (SVE) wells
- Collecting data from and sampling the West Fenceline and Public Works header lines and/or the RTO exhaust stack.

2. Equipment

The following equipment is required for SVE well data collection and sampling:

- Crow bars (2) (if needed)
- Extension cord (if needed)
- SVE Data Collection sheets and Toughbook with SVE Monitoring software
- Impact driver (or socket set) with 3/4 and 9/16 sockets (if needed)
- Oil/Water Interface probe
- Isopropyl alcohol
- Manometer(s) (measuring appropriate range(s))
- Nut driver – 5/16 (if needed)
- Paper towels
- PPE
    - ANSI Class II safety vest
    - Hardhat
    - Nitrile gloves
    - Leather gloves
    - Safety glasses
    - Steel-toe boots
    - FRC Clothing (when working within WRR)

- Power inverter (if needed)
- Sump pump (if needed)
- Geotech® peristaltic pump (or equivalent)
- Tedlar® bags
- Traffic barricades (orange cones)
- Tygon® tubing – 3/16" ID x 3/8" OD
- Teflon® tubing – 1/8" ID x 1/4" OD
- Black collection bag (trash bag)

The following equipment is required for the West Fenceline and Public Works header line and RTO exhaust stack data collection and sampling:

- Combination wrench 1/2 and 9/16 inch
- Extension cord
- Gast high flow vacuum pump
- Geotech® peristaltic pump
- Manometer(s) (measuring appropriate range(s))
- PPE
  - ANSI Class II safety vest
  - Hardhat
  - Nitrile gloves
  - Safety glasses
  - Steel-toe boots
  - FRC Clothing
- Summa canister
- Pressure gauge
- Regulators (flow controllers)
- Calibrated rotometer (or equivalent)

- Sample train
- Tedlar® bags
- Tygon® tubing – 3/16" ID x 3/8" OD
- Teflon® tubing – 1/8" ID x 1/4" OD
- Black collection bag (trash bag)

3. Procedures for SVE Wells

This section provides step-by-step procedures for data collection and soil vapor sampling of SVE wells. The field data sheet or the appropriate fields in the SVE Monitoring software should be filled out completely with the appropriate observations and data collected during sampling. All applicable components of the Health and Safety Plan, including completion of Job Safety Analysis (JSA) forms, will be followed while performing the activities described in this SOP.

Upon Arrival at Well

1. Position truck in front of the well to be sampled, turn on hazard lights.
2. Place traffic cones in front of and behind the truck.
3. Unlock the well vault, remove well vault bolts, use crow bars (if needed) to release vault latch, and pry open vault lid for underground wells or open above ground well vault to access well. Engage safety latch or chain (if present) to secure vault lid in open position. Record position of main SVE valve.
4. If sufficient rain water is present in vault to impede work, use a sump pump to drain the vault.
    - If water in vault has no evidence of sheen water can be pumped to ground surface.
    - If water in vault has evidence of sheen water must be pumped into 5–gallon containers and transferred to polyethylene tank located in rear of work vehicle. Containerized water is transported to Site 9 in WRR for proper management.

Sample Collection

1. Connect manometer to sample port and record the vacuum on the SVE well by connecting the appropriate digital manometer (SOP No. 53 Dwyer Digital

Manometer) to the sample port of the well and turning the sample port lever to the open position. If the vacuum reading fluctuates, record the highest, lowest, and the most consistent reading.

2. Write the well ID, date, sample time, vacuum, and sampler's initials on the Tedlar® bag.
3. Connect a clean piece of disposable Masterflex Tygon® tubing to the sample port of the SVE well.
4. Insert Masterflex Tygon® tubing into the peristaltic pump head.
5. Connect power cord to peristaltic pump and plug into battery, vehicle cigarette lighter, or other available power source (car battery adapter).
6. Inset hard plastic (e.g. Teflon) reducer on end of Tedlar® bag which will later connect to Masterflex Tygon® tubing.
7. Turn on the peristaltic pump with sample port open to purge Masterflex Tygon® tubing for approximately 60 seconds.
8. Connect Tedlar® bag to Masterflex Tygon® tubing.
9. Once the Tedlar® bag is full, close valve on Tedlar® bag, turn peristaltic pump off, close sample port, remove Tygon® tubing from Tedlar® bag and sample port and dispose of tubing.
10. Place Tedlar® bag sample in black collection bag to protect from sunlight while other samples are being collected and transported to on-site screening lab.

Fluid Level Measurement

1. Turn the main SVE valve to its fully closed position, if necessary.
2. Remove the sample plug from the well cap.
3. Turn the interface probe on and lower probe into the SVE well. Record fluid levels and total depth as described in SOP No. 10 Well Gauging Measurements. Additionally, record if the bottom surface of the well is hard or soft. Decontaminate the probe and tape as described in SOP No. 4 Decontamination.
4. Record the condition of the probe and tape upon removal (e.g. clean, product, sludge, foam, silt) and any well defects or maintenance issues.
5. Replace the sample plug into the well cap.

6. Return the main SVE valve to its original position, if closed in Step 1 above.
7. Disengage safety latch and lower vault lid. Replace well vault bolts (if needed) and lock the well vault.
8. Load traffic cones and other equipment and move to next well location.

4. Procedures for the Header Lines and Exhaust Stack

This section provides step-by-step procedures for data collection and soil vapor sampling of the Public Works and West Fenceline Headers located immediately upstream of the VLS units and the RTO Exhaust stack.

4.1 Data/Sample Collection at the Regenerative Oxidizer Unit – PW and WFL Header Lines

1. Connect appropriate manometer to sample port on the header line and record the vacuum (SOP No. 53 Dwyer Digital Manometer). Write the sample ID, date, sample time, vacuum, and sampler's initials on the Tedlar® bag.
2. Connect one end of a clean piece of disposable Masterflex Tygon® tubing to the header sample port and the other end to the inlet port of the Gast® high flow sample pump.
3. Connect clean section of Masterflex Tygon® tubing to the outlet port of the Gast® high flow sample pump.
4. Connect power cord to Gast® high flow pump and plug into ac power source, (extension cord with GFI plugged into wall outlet)
5. Inset hard plastic reducer on end of Tedlar® bag which will later connect to Masterflex Tygon® tubing.
6. Turn on the Gast® high flow pump with sample port open and allow pump to run for 10 seconds to purge the tubing
7. Connect Tedlar® bag to Masterflex Tygon® tubing on the outlet port of the Gast® high flow sample pump.
8. Once the Tedlar® bag is full, close valve on Tedlar® bag.
9. Turn Gast® high flow pump off, close sample port, and remove/dispose of Masterflex Tygon® tubing from Tedlar® bag and sample port.

10. Place Tedlar® bag with sample in black collection bag to protect from sunlight while other samples are being collected and transported to on-site screening lab.

4.2 Summa Canister Sample Collections - PW and WFL Header Lines

Prior to Sampling - PW and WFL Header Lines

1. Remove brass cap from stainless steel canister.
2. Attach the pressure gauge provided by the laboratory to the stainless steel canister inlet.
3. Open valve completely.
4. Record the vacuum reading on the canister tag. The canister should show a vacuum of approximately 28 inches of mercury (Hg). If the canister does not show a vacuum or shows a vacuum of less than 26 inches of Hg, then:
    - Label the canister tag with "Insufficient vacuum – No Sample";
    - Set canister aside for return to the laboratory; and
    - Contact task manager and lab coordinator if canister failures affect field work.
5. Close valve completely.
6. Remove the pressure gauge.
7. If not immediately using the stainless steel canister for sample, place and tighten brass cap on stainless steel canister.

Sampling - PW and WFL Header Lines

1. Collect a Tedlar® bag sample using steps 1 through 9 from Section 4.1 above.
2. Remove brass cap, attach particulate filter and sample train to the canister using wrenches.
3. Using a clean piece of disposable silicone tubing, connect the hose barb attached to the sample train to the exhaust port on the Gast® pump.
4. Open the sample canister. Allow sample to enter the canister until the vacuum reads approximately between 5 and 10 inches of Hg. **The vacuum gauge should reach less than 10 inches Hg, but should not be allowed to drop below 2 inches of Hg.**
5. Turn off Gast® pump and close valve to the sample port.
6. Close the sample canister valve completely and remove the sample train using wrenches. Replace brass cap onto canister while leaving the particulate filter in place.

7. Close the sample port on the exhaust/header line and properly dispose of any used silicone tubing.

After Sampling - PW and WFL Header Lines

1. Attach the pressure gauge provided by the laboratory to the stainless steel canister inlet.
2. Open valve completely.
3. Record reading. There should still be a vacuum in the stainless steel canister. If the canister does not show a net loss in vacuum after sampling of at least 10 inches Hg, evaluate and document the problem. If necessary, contact the project manager immediately to determine the value of using another stainless steel canister to recollect the sample.
4. Close valve completely.
5. Remove the pressure gauge.
6. Place and tighten brass cap on stainless steel canister.

4.3 Data/Sample Collection at the Regenerative Oxidizer Unit – Exhaust Stack

1. Connect appropriate manometer to sample port on the exhaust stack and record the vacuum (SOP No. 53 Dwyer Digital Manometer). Write the sample ID, date, sample time, vacuum, differential pressure, and sampler's initials on the Tedlar® bag.
2. Connect a clean piece of disposable Masterflex Tygon® tubing to the sample port of the exhaust stack and insert into peristaltic pump.
3. Inset hard plastic reducer on end of Tedlar® bag which will later connect to Masterflex Tygon® tubing.
4. Turn on the Geotech® peristaltic pump with sample port open. Allow pump to run for at least 60 seconds to purge the sample line.
5. Use a calibrated rotometer or equivalent to set the speed of the peristaltic pump at approximately 125mL/min.
6. At the beginning of poppet valve switch, connect Tedlar® bag to Masterflex Tygon® tubing.
7. After 2 cycles of poppet valve switching, close valve on Tedlar® bag,

8. Turn peristaltic pump off, close sample port, and remove/dispose of Masterflex Tygon® tubing from Tedlar® bag and sample port.
9. Place Tedlar® bag with sample in black collection bag to protect from sunlight while other samples are being collected and transported to on-site screening lab.

4.4 Summa Canister Sample Collection – Exhaust Stack

Prior to Sampling - Exhaust Stack

1. Remove brass cap from stainless steel canister.
2. Attach the pressure gauge provided by the laboratory to the stainless steel canister inlet.
3. Open valve completely.
4. Record reading on the canister tag. The canister should show a vacuum of approximately 28 inches of mercury (Hg). If the canister does not show a vacuum or shows a vacuum of less than 26 inches of Hg, then:
   - Label the canister tag with "Insufficient vacuum – No Sample";
   - Set canister aside for return to the laboratory; and
   - Contact task manager and lab coordinator if canister failures affect field work.
5. Close valve completely.
6. Remove the pressure gauge.
7. If not immediately using the stainless steel canister for sample, place and tighten brass cap on stainless steel canister.

Sampling - Exhaust Stack

1. Collect a Tedlar® bag sample using steps 1 through 7 from Section 4.3 above.
2. Remove brass cap, attach particulate filter and sample train to the canister using wrenches.
3. Using a clean piece of disposable silicone tubing, connect the hose barb attached to the sample train to the sample tubing on the peristaltic pump.
4. At the beginning of the poppet valve switch, open the sample canister. Allow sample to enter the canister though 2 cycles of poppet valve switching and the vacuum reads approximately between 5 and 10 inches of Hg. **The vacuum gauge should reach less than 10 inches Hg, but should not be allowed to drop below 2 inches of Hg.**

5. Close the sample canister valve completely and remove the sample train using wrenches.
6. Close the sample port on the exhaust line and properly dispose of any used silicone tubing.

After Sampling - Exhaust Stack

1. Attach the pressure gauge provided by the laboratory to the stainless steel canister inlet.
2. Open valve completely.
3. Record reading. There should still be a vacuum in the stainless steel canister. If the canister does not show a net loss in vacuum after sampling of at least 10 inches Hg, evaluate and document the problem. If necessary, contact the project manager immediately to determine the value of using another stainless steel canister to recollect the sample.
4. Close valve completely.
5. Remove the pressure gauge.
6. Place and tighten brass cap on stainless steel canister.

1. Objective

The purpose of this Standard Operating Procedure (SOP) is to provide a consistent methodology for the collection of soil vapor samples from vapor monitoring points related to the Roxana soil vapor extraction (SVE) system. This SOP details the necessary procedures to follow so that representative samples are collected. These procedures are applicable to any soil vapor sample collected at vapor monitoring points (VMPs). Important uses of these data include:

- SVE system performance evaluation
- Evaluation of sub-slab VOC concentrations
- Hydrocarbon plume definition

2. Equipment

The following equipment is required for sample collection.

- Dwyer Series 475 Mark III Digital manometer
- 1-liter Tedlar bags
- Silicone tubing - 3/16" ID x 3/8" OD
- Polyethylene tubing – 3/16" ID x 1/4" OD
- Peristaltic pump – 60-350 RPM
- BIOS DC-LITE flow calibrator or calibrated rotometer (0-500 mL/min)
- 60-mL syringe
- Crescent wrench (or equivalent hand tools)
- New or dedicated 4-way micro valves for purging and sampling
- SVE System Effectiveness Monitoring Forms or Toughbook with SVE Monitoring software

3. Procedures

Initial Vacuum/Pressure Measurement

Using a Dwyer Series 475 Mark III digital manometer, the initial vacuum/pressure is measured. Basic manometer operation instructions can be found in SOP No. 53 Dwyer Digital Manometer.

At VMP monitoring locations the positive fitting of the manometer shall be connected to the

well. The negative fitting on the manometer shall remain open to the atmosphere. The pressure and time, are immediately read and recorded to the nearest hundredth of an inch (or tenth of an inch if using 0-200 manometer) of water column on the SVE System Effectiveness Monitoring Form or Toughbook with SVE Monitoring software. Immediately following the recording of the vacuum/pressure measurement, the well shall be closed to the atmosphere.

Well Purging

After obtaining the initial vacuum/pressure measurements and prior to soil vapor sample collection, each monitoring location shall be purged a predetermined amount based on the volume of the well riser and screen. The purge volume shall be equivalent to a minimum of three well volumes. The actual purge volume removed shall be recorded on the appropriate field form. If the well will not yield the purge volume or if water and/or product are encountered during purging, this observation shall be documented in the appropriate field form. The well screen is presumed to be submerged when this condition is encountered. No sample is to be collected and no stabilized reading is required.

To purge VMP monitoring locations, a 60-mL plastic syringe is attached to the well to allow the removal of the required purge volume. The syringe plunger shall be drawn back to evacuate a purge volume.

Well Sampling

Upon completion of well purging, soil vapor sample collection using Tedlar sample media may commence. If water and/or product are encountered during sample collection, this observation shall be documented on the appropriate field form. Note that samples which indicate the presence of water and/or product shall not be analyzed.

Tedlar Bag Samples

Air samples for on-site screening shall be collected using a Tedlar bag and a peristaltic pump. For VMP monitoring locations, the inlet of the peristaltic pump tubing is attached to the well and the positive pressure (output) side of the peristaltic pump shall be attached to the inlet side of the flow calibrator (or rotometer) using a combination of Tygon® and polyethylene (or equivalent) tubing. Prior to flow-rate adjustment and sample collection, the sample identification, date, time of initial vacuum reading, and initial vacuum/pressure reading (if applicable) shall be clearly marked on the Tedlar bag.

Flow Rate Adjustment

The rotometer shall be used to adjust the flow rate of the peristaltic pump to allow a flow rate of 200 mL/minute. For VMP wells, this adjustment shall be performed by observing the flow rate indicated by the ball height and adjusting the peristaltic pump to allow a flow rate of 200 mL/minute. *Notes: The initial settings on the pump should be set to allow for the minimum flow possible. It is important to set the flow rate as quickly as possible in order to minimize the amount of additional sample purge.* After setting the sample flow, sample collection shall be immediately initiated. Care shall be taken at this time to avoid unintentionally adjusting (by bumping or handling) the pump speed control.

Sample Collection

After setting the sample flow, the rotometer shall be removed from the sample train and a new, clean, pre-labeled one-liter Tedlar bag shall be connected to the tubing exiting from the output side of the peristaltic pump. A wire tie shall be used, if necessary, to make the connection between the bag and the pump a leak-proof fitting. Immediately open the valve on the Tedlar bag approximately one turn. *Please note: The sample time is the same time as the acquisition of the initial vacuum/pressure reading. If a vacuum/pressure reading was not collected, the sample start time shall be documented on the appropriate field form* Based on the flow rate to collect a 1-liter vapor sample, the peristaltic pump shall be allowed approximately five (5) minutes to collect the sample. Total sample collection time, which may exceed five (5) minutes, is dependent on the soil characteristics of the stratum from which the sample is being collected. Upon retrieval of the one-liter sample volume, close the valve on the Tedlar bag, turn off the peristaltic pump, and close the well to the atmosphere. Place the sample bag in a black trash bag or container that will minimize exposure to sunlight.

Duplicate samples shall be collected by repeating the procedure detailed above. The duplicate sample shall be collected immediately after the first sample (original sample) has been collected. Due to the nature of the coarse-adjustment valves that are typically installed on Tedlar bags, the use of a sample splitter is not recommended and will often result in the collection of unequal sample volumes. Duplicate samples shall be obtained at a frequency of one per every twenty original samples collected.

Post-Sample Collection

Dismantle the sample train, dispose of all non-dedicated lines used for sample collection. New sample lines at each sample location shall be used, except for dedicated equipment. Non-dedicated, reusable equipment shall be decontaminated according to SOP No 4 Decontamination.

Venting

Following sample collection, VMP wells are vented (opened to atmosphere) for 15 minutes. This allows for well stabilization to occur.

Final (Stabilized) Vacuum/Pressure Measurement

After venting, a final, stabilized vacuum/pressure measurement shall be recorded. A pressure is considered to be stabilized when it does not fluctuate more than 5% in one minute. The manometer shall be allowed a maximum of thirty (30) minutes to stabilize before the vacuum/pressure is recorded. If the manometer does not stabilize within the 30-minute period, the range in which the vacuum/pressure fluctuates over an additional one (1) minute period will be documented on the appropriate field form. The highest reading observed within the observed range will also be recorded on the appropriate field form. (*Please note: If the manometer reading fluctuates between two vacuums, the lowest/weakest vacuum observed will be recorded on the field form. If the manometer reading fluctuates between a vacuum and a pressure, the highest pressure observed will be recorded on the field form. If the manometer reading fluctuates between two pressures, the highest/strongest pressure observed will be recorded on the field form. In all cases, the range in the manometer readings over the additional one-minute period will be recorded on the field form.)*

At VMP monitoring locations, the manometer should be turned on, zeroed, and connected to the well as it was for the initial pressure. Once the pressure is stabilized the reading should be taken. The manometer can then be removed and the well can be closed to the atmosphere.

Note: Any monitoring location where water/product is encountered during purge or Tedlar collection, where the requisite volume cannot be purged, or where the well screen is submerged will not have a stabilized pressure collected.

URS
Shell Oil Products US
SVE Effectiveness Monitoring

SVE:_____ Date:_____

Technician(s):_____ Time Arrived:_____

SVE System Running at_____ in wc

Gauge Reading_____ in Hg Gauge type/brand_____

Valve Position Upon Arrival: Open / Closed Position/Notch # :_____
Valve Position Upon Departure: Open / Closed Position/Notch # :_____

Vacuum Reading:_____ in wc Time:_____ Surface Temp of Flow Meter

If Surging:_____ in wc to_____ in wc _____ °F

Flow Differential (pitot / venturi):_____ in wc Time:_____

If Surging:_____ in wc to_____ in wc
Water in Pitot Tube: Yes / No

Tedlar Bag Sample: Yes / No If Yes: Time Sample Taken:_____

Well/Vault Integrity
Quantity of Water in Vault:_____ Short Circuiting: Yes / No

Drain Plug: In / Out / Pulled - Time:_____ Hear Well Surge Yes / No

Condition of Well/Vault/Valves:

SILT and WATER INVESTIGATION

Time:_____ DTW:_____ Bottom: Hard / Soft

TD:_____

Condition of Tape After Removal:
Circle One: Dilution Valve / Stinger / Bubbler Tube / None in Well

Date Well Last Cleaned:_____ Header Line Last Cleaned:_____

AIR ANALYSIS

FID TVA 1000 4-Gas Meter

PID ppm FID ppm $\%O_2$ $\%CO_2$ %LEL

Dilution Probe Used: Yes / No If Yes, Dilution Ratio:_____

1. Introduction

The purpose of this Standard Operating Procedure (SOP) is to provide a consistent methodology for the screening of soil vapor samples from the Rand Avenue and Roxana Sites. Whenever possible, the soil vapor samples collected for the various work tasks will be screened on the same day of collection. If same-day screening is not possible due to time constraints, instrument problems, etc., the samples will be screened within 24-hours of sample collection. This SOP details the necessary procedures to follow in order to ensure that valid total vapor phase hydrocarbons, oxygen, methane and carbon dioxide concentration data is collected and adequately documented. These procedures are applicable to any vapor sample collected at the Roxana site, but are particularly useful for samples collected from vapor monitoring ports (VMPs), SVE wells, and sub-slab (SS) ports that are located throughout the village. Important uses of these data include:

- Evaluation of indoor air or sub-slab methane concentrations
- Screening of indoor air or sub-slab petroleum hydrocarbon concentrations
- Evaluation of the performance of the Roxana Soil Vapor Extraction System.
- Evaluation of the performance of the Rand Avenue Remediation System
- Ambient air samples can either be collected and analyzed on-location using real-time instrumentation (TVA 1000, GEM 2000, etc), or collected in Tedlar™ sample media and analyzed at a dedicated sample analysis station.

2. Equipment

The following materials will be used to perform sample screening, either on-site or at a dedicated sample screening station:

- TVA-1000, PPbRAE, and LANDTEC GEM-2000 real-time monitors (or similar);
- Calibration gas cylinders, including;
  - Methane in air at concentrations of 50; 500; 5,000, and 32,500 ppmv
  - Isobutylene in air at concentrations of 10, 50 and 1,000 ppmv
  - Hydrocarbon-free air
  - 35 percent by volume concentration CO2
- Regulators for calibration gas cylinders

- SKC sorbent tubes (part # 226-09) used for methane determination
- ¼-inch O.D. Teflon™ or Tygon™ tubing cut to length
- 10-to-1 dilution probe (Thermo Environmental Instruments Part #CR010MR)
- Disposable 4-way plastic valves used to switch the sample between methane and total hydrocarbon analyses.

3. Procedure

The following instruments will be used to screen soil vapor samples:

- TVA-1000 or performance equivalent for volatile organic compounds (VOCs) and methane by flame ionization detector (FID) and for VOCs by photoionization detector (PID)
- PPbRAE or performance equivalent for VOCs by PID for low-concentration samples
- LANDTEC GEM-2000 or performance equivalent for oxygen and carbon dioxide.

Immediately prior to use, each instrument will undergo a calibration check. In the event that instrument accuracy is not within 15-percent of the designated calibration check standard concentration, the instrument will be recalibrated. Field personnel will follow applicable instrument operation SOP's and/or manufacturer's recommended procedures for the calibration and operation of the instruments. Calibration data will be documented on the appropriate calibration forms for each instrument.

Calibration Procedures Applicable to All Field Screening Analyses

Instruments will be calibrated in accordance with applicable SOPs and/or manufacturers recommended procedures at the beginning of the day. If the screening instruments are to be used throughout the work day, a mid-day and end-day calibration check will be performed. Further, the TVA 1000 instrument detectors and associated dilution probe will be bump checked (1-point accuracy check) approximately every two hours in order to document instrument stability. In the event that a bump check indicates a deviation greater than ± 15percent from the designated bump-gas concentration, a full instrument calibration will be performed. Due to negligible (<5-percent) instrument drift throughout the day, the LANDTEC GEM-2000 and PPbRAE will not undergo bi-hourly bump checks. Instead, calibration accuracy checks will be conducted at approximately midday, and again at the conclusion of the sample event.

As stated above, calibration of the Landtec GEM-2000, TVA-1000, and PPbRAE will be

performed in accordance with applicable SOPs and/or manufacturer recommended procedures. However, the wide range of petroleum hydrocarbons and methane concentrations present at the site (i.e., greater than four orders-of magnitude) may be outside of the linear range of the TVA-1000 FID. To meet a primary data quality objective of the project (i.e., to quickly and accurately determine whether a potentially explosive condition is present at a sampling location), the FID calibration will be based on a calibration standard that is approximately 10% of the lower explosive limit (LEL) for methane (5,000 ppmv). However, additional QC procedures will be implemented to ensure quality data for both hydrocarbon and methane concentrations.

The linearity of instrument response will be verified by using 50 ppmv, 500-ppmv methane standards. If significant non-linear response (i.e., greater than 15% relative root mean square error) is observed, a nonlinear calibration curve will be developed. The relative response factor for isobutylene (which is used here as a surrogate for petroleum vapors) will be determined by using a 1,000 ppmv (nominal) isobutylene calibration standard. (1,000 ppmv is approximately 10% of the LEL for gasoline.)

Calibration shall be considered adequate when check standards are within +/- 15%. If the calibration check standards are outside that range, a second check standard will be run and if the check standard fails again, the instrument will be recalibrated and data obtained since the last check standard was successfully run will be flagged as estimated values.

Analysis of Concentrated Samples Utilizing a Dilution Probe

Because samples will need to be analyzed which are above the measurement range of the FID or which may not have sufficient oxygen content to analyze reliably, dilution of some samples will be required prior to analysis. The 10:1 dilution probe will be calibrated using the 32,500 ppmv methane standard. Calibration of the dilution probe is considered complete when the FID response to this standard is within ± 15-percent of 3,250 ppmv.

The critical orifice in the dilution probe is density-dependent. As it will be calibrated using a 3.25% methane standard that has a density of 98.6% that of air, samples that have a density significantly different from that will be subject to some level of deterministic error. Samples that have extremely high hydrocarbon or methane concentrations have the potential to have significantly varying densities, which can introduce significant error when the analysis relies on the dilution probe. For example, error in excess of 10% will be present at concentrations of methane above 40% (if significant concentrations of petroleum hydrocarbons are not present).

Because the average density of petroleum hydrocarbon vapors is variable, the error is not as readily quantified for elevated concentrations petroleum hydrocarbons. Assuming an average density of 2.5 times that of air (i.e., density equivalent to isopentane), error in excess of 10% will be present at concentrations of petroleum hydrocarbon above 17% (if significant concentrations of methane are not present).

The density error associated with methane and heavier hydrocarbons have the potential to offset each other. Because the average density of measured hydrocarbon will not be known, data associated with an estimated error greater than 10% due to the presence of hydrocarbon or methane will be flagged as estimated, rather than corrected for an assumed density. As the concentrations at which significant error is introduced are well above project action levels, estimated concentrations at these ranges are considered adequate to meet project data quality objectives.

Analysis of Samples Utilizing a Charcoal Scrubber Tube to Filter Heavy Hydrocarbons

Use of the sorbent tube to screen out hydrocarbons other than methane affects the function of the FID instrument by lessening the flow of air through the detector. Preliminary testing indicates that a 25% to 30% reduction in instrument response occurs over the linear calibration range of the instrument. To calibrate the instrument for use of the sorbent tube, the 50, 500 and 5,000-ppmv methane standards will be run with the sorbent tube to determine the relative response of the instrument to methane passed through the sorbent tube. The relative response factor (RRF) for each calibration standard will be calculated as:

$$RRF = \frac{FID_{sorb}}{FID_{raw}}$$

Where;

RRF = relative response factor;

FID_{sorb} = Instrument response with sorbent tube; and

FID_{raw} = Instrument response to calibration standard without sorbent tube

The average RRF shall be used as a correction factor for samples analyzed using the sorbent tube. It is not necessary to correct instrument response (other than multiplying the displayed value by 10) when using the 10:1 dilution probe in conjunction with the sorbent tube. When using the dilution probe, the majority (approximately 90-percent) of the sample that is analyzed is actually dilution air that does not pass through the sorbent tube.

4. Sample Screening

Most soil vapor samples collected in Tedlar ™ bags will be screened at a fixed location using the instrumentation noted above. The fixed location facilitates the use of the instrumentation, allows for a more stable environment in which to screen the samples, and provides adequate space in which to perform the screening and complete the associated documentation. However, to allow rapid screening of indoor air and sub-slab soil vapor, such samples can be analyzed on site, using the same field instrumentation. The calibration of these instruments, as outlined in Section 4.0, will be performed in such a way that instrument response is most accurate in the concentration range that corresponds to project action levels.

The TVA-1000 has been configured with a switching device (disposable valve) to allow sample to be passed through an SKC carbon sorbent tube to remove petroleum hydrocarbons (i.e., site data indicate that the remainder will be primarily methane).

Procedures for Sample Screening On Site

- Screen air sample with LANDTEC Model GEM-2000 landfill gas analyzer. Quickly document oxygen and carbon dioxide concentrations on the appropriate sample screening data sheet;
- Screen sample with the TVA 1000 PID or PPbRAE PID instrument and quickly document the concentration on the appropriate data sheet; and
- Set the TVA-1000 to sample through the SKC sorbent tube used in conjunction with the FID.

  Calculate the methane concentration as;

$$C_{meth} = \frac{FID}{RRF};$$

  Where

  C_{meth} = methane concentration (ppmv); and

  FID = FID reading (ppmv)

- Switch the TVA-1000 to sample without the sorbent tube. Screen the sample with the TVA-1000 and quickly record the vapor concentration by FID on the appropriate data sheet; and
- The hydrocarbon concentration portion of the FID response should be calculated as;

$$HC = C_{raw} - C_{meth};$$

Where

HC = hydrocarbon concentration (ppmv); and

C_{raw} = FID reading without sorbent tube (ppmv)

Procedures for Sample Screening at a Dedicated Sample Analysis Station

The sampling instrumentation for the dedicated sample analysis station has been configured such that the TVA-1000 can be operated with a 10:1 dilution valve, if concentrations are outside the operational range of the FID (i.e., if there is insufficient oxygen to support the FID flame or if the sample is above the linear range of the instrument).

- Open the valve on the Tedlar™ bag sample approximately one turn and attach to the inlet of the LANDTEC Model GEM-2000 landfill gas analyzer. Quickly document oxygen and carbon dioxide concentrations on the appropriate sample screening data sheet (attached);
- Immediately connect the sample bag to the PPbRAE PID instrument and quickly document the concentration on the appropriate data sheet. If the instrument registers over range, the VOC concentration by PID will be completed using the TVA-1000 PID;
- If the oxygen concentration in the sample is less than 16-percent, configure the TVA-1000 for use with a 10-to-1 dilution probe. The dilution probe will allow for the sample to be screened by FID without flameout associated with low oxygen concentration samples. The dilution probe must be separately calibrated and should be used for sample analysis by FID only;
- Set the TVA-1000 to sample through the SKC sorbent tube. Record the reading as the methane concentration. If the 10-to-1 dilution probe is used, the displayed concentration (FID) must be multiplied by 10;
- Switch the TVA-1000 to sample without the sorbent tube. Immediately connect the sample bag to the TVA-1000 probe inlet and quickly record the vapor concentration by FID on the appropriate data sheet. If the 10-to-1 dilution probe is used, the displayed concentration (FID) must be multiplied by 10; and

- The hydrocarbon (HC) concentration portion of the FID response should be calculated as:

$$HC = C_{raw} - C_{meth}\,.$$

Procedures Applicable to All Sample Screening

Because concentrations of hydrocarbons in some samples are elevated, the carbon in the sorbent tube can be saturated with hydrocarbon relatively quickly. Therefore, the following protocols are in place to assure quality data:

- The sorbent tube will be replaced at least every 10 samples;
- The sorbent tube will also be replaced, if breakthrough is observed (readily apparent) or if concentrations do not go to zero after sample is removed from analyzer inlet; and
  Associated sample lines (Teflon™ or Tygon™ tubing), valves, etc. will be replaced if concentrations do not return to zero after sample is removed from analyzer inlet.

5. Conclusion

The screening of soil gas samples must be conducted in an organized and precise manner. The resultant data will be valid only if proper procedure and associated QA/QC is followed. It is imperative that personnel conducting the sample screening strictly adhere to the protocol detailed above. Because the samples are collected in 1-liter bags, the samples must be removed from the instrument inlets as soon as a stable reading can be documented. Failure to do so will result in an inadequate amount of sample volume to complete all the screening parameters. Larger bags cannot be used due to time constraints during sample collection.

1. Introduction to the Dwyer Digital Manometer

The Dwyer Series 475 Mark III Digital Manometer is used by personnel in the field to measure vacuum/pressure at wells throughout the Village of Roxana and at the Rand Avenue Remediation Site. Personnel responsible for using a manometer are required to read the manufacturer's instruction manual and be trained in the operation of the instrument.

2. Zeroing the Manometer

The manometer is zeroed before each measurement. This is done by either depressing the "zero" button located on the front of the manometer, or adjusting the knob ("zero adjust knob") on the top of the manometer (depending on which model is being used) while both positive and negative connections are open to the atmosphere. The "zero" button will automatically zero the instrument. The knob must be turned either clockwise (more positive) or counterclockwise (more negative) depending upon whether the manometer is reading positive or negative.

3. Vacuum / Pressure Measurement

The manometer shall be set on the "inches of water column" unit setting which can be done by depressing the "E/M" button and scrolling until "in/H2O" is found.

The positive fitting of the manometer shall be connected to the appropriate vacuum measurement fitting located on the well. The negative fitting on the manometer shall remain open to the atmosphere. The vacuum/pressure is immediately read and recorded to the nearest hundredth of an inch (or tenth of an inch if using 0-200 manometer) of water. The manometer can then be removed from the vacuum measurement fitting.

4. Maintenance and Calibration

If the "low bat" indicator is lit on the manometer display, the battery needs to be replaced. A weak battery can cause improper operation or inaccurate measurements. The battery is changed by unscrewing the flathead screws located on the bottom of the manometer and removing the battery plate. The 9 volt alkaline battery will slide out and can then be unclipped from the wiring. Install a fresh battery and secure the battery plate. When replacing the cover, be sure the rubber sealing gasket is properly seated in the gasket channel of the endcap. Note the endcap will only fit one way.

In the event that the manometer comes in contact with water or other conditions which cause the display to either not power on, or to read incorrectly, the manometer should be sent back to the manufacturer for calibration.

Exceeding the range of the manometer will not damage it or affect calibration if the maximum pressure is not exceeded. Exceeding the maximum pressure will cause permanent damage to the sensor and may rupture the housing and/or cause injury. The maximum pressure is shown on the rear label of the manometer.

Manometers should be sent back to the manufacturer or certified calibration agency every six (6) months for calibration following the "Manometer Calibration Schedule." Calibration and maintenance records as well as calibration certificates are maintained on site.

APPENDIX O Federally Enforceable State Operating Permit

340061 - 2011-07-14-ACC

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19506, SPRINGFIELD, ILLINOIS 62794-9506 - (217) 782-2113
PAT QUINN, GOVERNOR LISA BONNETT, INTERIM DIRECTOR

217/782-2113

JOINT CONSTRUCTION AND OPERATING PERMIT

RECEIVED
JUL 22 2011

PERMITTEE

Shell Oil Products US
Attn: Kevin E. Dyer
17 Junction Drive PMB 399
Glenn Carbon, Illinois 62034

Application No.: 11060036
Applicant's Designation: ROXANA SITE
Subject: SVE System with RTO Control
Date Issued: July 14, 2011
Location: Corner Chaffer Street and 8th Street, Roxana, Madison County

I.D. No.: 119090AAO
Date Received: June 13, 2011
Expiration Date: See Condition 1.

This permit is hereby granted to the above-designated Permittee to CONSTRUCT and OPERATE emission unit(s) and/or air pollution control equipment consisting of a soil vapor extraction (SVE) system with regenerative thermal oxidizer (RTO) control pursuant to the above-referenced application. This permit is subject to standard conditions attached hereto and the following special condition(s):

1a. This operating permit is effective only if the Permittee has complied with all standard conditions of the construction permit.

b. This operating permit shall expire 18 months from the date of issuance noted above.

c. This permit shall terminate if it is withdrawn or is superseded by a revised permit.

2a. This permit is issued based on the construction of the SVE system with RTO control not constituting a new major source or major modification pursuant to Title I of the Clean Air Act, specifically 35 Ill. Adm. Code Part 203, Major Stationary Source Construction and Modification. The source has requested that the Illinois EPA establish emission limitations and other appropriate terms and conditions in this permit that limit the emissions of volatile organic materials (VOM) from the above-listed equipment below the levels that would trigger the applicability of these rules.

b. This permit is issued based on the emissions of Hazardous Air Pollutants (HAP) as listed in Section 112(b) of the Clean Air Act from the above-listed equipment being less than 10 tons/year of any single HAP and 25 tons/year of any combination of such HAPs. As a result, this permit is issued based on the emissions of all HAPs from the above-listed equipment not triggering the requirements of Section 112(g) of the Clean Air Act.

c. The operation of the emission units under this construction permit shall not begin until construction of the associated air pollution control equipment is complete and reasonable measures short of actual operation have been taken to verify proper operation.

3a. The Permittee shall operate the system such that the emissions and operation of the SVE/RTO system not exceed the following limits:

Maximum VOM Emissions		
(Lbs/Hour)	(Tons/Month)	(Tons/Year)
8.0	2.4	24.9

These limits are based on 35 Ill. Adm. Code 219.301, information in the application, and emissions shall be calculated using the following equation:

$$\textit{Emissions}\ (\textit{tons}) = \left[\frac{\text{Total SVE/RTO System Exhaust Contaminant Concentration (ppmv)} \times \text{SVE/RTO System Exhaust Flowrate (scfm)} \times 100\ \text{lb/lb-Mole} \times 60\ \text{min/hour}}{10^6 \times 387\ \text{cu ft/lb-Mole}}\right] \times \textit{Hours Operated} \div \frac{2000\ \#}{\textit{Ton}}$$

b. The emissions of Hazardous Air Pollutants (HAPs) as listed in Section 112(b) of the Clean Air Act from the SVE/RTO system shall not exceed 0.79 tons/month and 7.90 tons/year of any single HAP and 1.9 tons/month and 19.9 tons/year of any combination of such HAPs. As a result of this condition, this permit is issued based on the emissions of any HAP from the SVE/RTO system not triggering the requirements of Section 112(g) of the Clean Air Act and the NESHAP for Site Remediation, 40 CFR 63 Subpart GGGGG.

c. Combustion emissions of the RTO shall not exceed the following limits:

Total Maximum firing rate = 1.4 mmBtu/hour

	Emission Factor	Emissions	
Pollutant	(Lbs/mmBtu)	(Tons/Mo)	(Tons/Yr)
Carbon Monoxide (CO)	0.00745	0.01	0.05
Nitrogen Oxides (NO_x)	0.10	0.07	0.62
Particulate Matter (PM)	0.0824	0.06	0.51
Sulfur Dioxide (SO_2)	0.60	0.37	3.70

These limits are based on maximum firing rate and information in the application.

d. Compliance with annual limits shall be determined on a monthly basis from the sum of the data for the current month plus the preceding 11 months.

4. Pursuant to 40 CFR 63.10(b)(3), if an owner or operator determines that his or her stationary source that emits (or has the potential to emit, without considering controls) one or more hazardous air pollutants regulated by any standard established pursuant to Section 112(d) or (f) of the Clean Air Act, and that stationary source is in the source category regulated by the relevant standard, but that source is not subject to the relevant standard (or other requirement established under 40 CFR Part 63) because of limitations on the source's potential to emit or an exclusion, the owner or operator must keep a record of the applicability determination on site at the source for a period of 5 years after the determination, or until the source changes its operations to become an affected source, whichever comes first. The record of the applicability determination must be signed by the person making the determination and include an analysis (or other information) that demonstrates why the owner or operator believes the source is unaffected (e.g., because the source is an area source). The analysis (or other information) must be sufficiently detailed to allow the USEPA and/or Illinois EPA to make a finding about the source's applicability status with regard to the relevant standard or other requirement. If relevant, the analysis must be performed in accordance with requirements established in relevant subparts of 40 CFR Part 63 for this purpose for particular categories of stationary sources. If relevant, the analysis should be performed in accordance with USEPA guidance materials published to assist sources in making applicability determinations under Section 112 of the Clean Air Act, if any. The requirements to determine applicability of a standard under 40 CFR 63.1(b)(3) and to record the results of that determination under 40 CFR 63.10(b)(3) shall not by themselves create an obligation for the owner or operator to obtain a Title V permit.

5. At all times, the Permittee shall maintain and operate the remediation system in a manner consistent with good air pollution control practice for minimizing emissions.

6. In the event that the operation of this source results in an odor nuisance, the Permittee shall take appropriate and necessary actions to minimize odors, including but not limited to, changes in raw material or installation of controls, in order to eliminate the odor nuisance.

7a. The Permittee shall, in accordance with the manufacturer(s) and/or vendor(s) recommendations, perform periodic inspections and maintenance on the equipment covered under this permit such that the equipment be kept in proper working condition and not cause a violation of the Environmental Protection Act or regulations promulgated therein.

b. Pollution control devices shall be in operation at all times when the associated emission unit(s) is in operation and emitting air contaminants.

8. The Permittee shall maintain monthly records of the following items:

   a. Measured exhaust total VOM and HAP (single and combined) contaminant concentration (ppmv) in exhaust air flow samples exhausting the SVE/RTO system. These samples and measurements shall be taken at start-up, once/day for first 3 days, 2 times/week for first 3 weeks, and once every month thereafter. Air samples from the first four months of operation shall be sent to a certified lab and analyzed by USEPA method TO-15. After the first 4 months of operation, the Permittee may measure exhaust total VOM and HAP contaminant concentration (ppmv) in exhaust air using an appropriately calibrated photo or flame ionization detector on a once/month basis.

   b. Exhaust air flow rate (dscfm) from the SVE/RTO system at start-up, once/day for first 3 days, 2 times/week for first 3 weeks, and once every month thereafter;

   c. Hours of operation of the system (hours/month, hours/year);

   d. Propane/natural gas usage (mmscf/month, mmscf/year); and

   e. VOM and HAP (single and combined) emissions (tons/month, tons/year) based on using the equation in Condition 3 and the data collected in a, b and c above, and SO_2, NO_x, PM, and CO RTO combustion emissions (tons/month, tons/year).

9. All records and logs required by this permit shall be retained at a readily accessible location for at least five (5) years from the date of entry and shall be made available for inspection and copying by the Illinois EPA or USEPA upon request. Any records retained in an electronic format (e.g., computer storage device) shall be capable of being retrieved and printed on paper during normal source office hours so as to be able to respond to an Illinois EPA or USEPA request for records during the course of a source inspection.

10. If there is an exceedance of or deviation from the requirements of this permit as determined by the records required by this permit, the Permittee shall submit a report to the Illinois EPA's Compliance Section in Springfield, Illinois within 30 days after the exceedance/deviation. The report shall include the emissions released in accordance with the recordkeeping requirements, a copy of the relevant records, and a description of the exceedance or deviation and efforts to reduce emissions and future occurrences.

11. Two (2) copies of required reports and notifications shall be sent to:

    Illinois Environmental Protection Agency
    Division of Air Pollution Control
    Compliance Section (#40)
    P.O. Box 19276
    Springfield, Illinois 62794-9276

and one (1) copy shall be sent to the Illinois EPA's regional office at the following address unless otherwise indicated:

Illinois Environmental Protection Agency
Division of Air Pollution Control
2009 Mall Street
Collinsville, Illinois 62234

It should be noted that during the review of this application it was determined that your facility has the potential to emit (PTE) more than 10 tons per year of a single Hazardous Air Pollutant (HAP), more than 25 tons per year of combined HAPs, and more than 100 tons per year of volatile organic material (VOM) and will be classified as a major source under the Clean Air Act Permit Program (CAAPP). To avoid the CAAPP permitting requirements, you may want to consider applying for a Federally Enforceable State Operating Permit (FESOP) at your earliest convenience if your actual HAP and VOM emissions are below the major threshold levels. A FESOP is an operating permit which contains federally enforceable limits in the form of permit conditions which effectively restrict the potential emissions of a source to below major source threshold, thereby excluding the source from the CAAPP.

Please be advised that CAAPP permit forms must be used when applying for a CAAPP or FESOP. For your convenience, the applicable forms are available on the Illinois EPA website.

If you have any questions on this permit, please contact Charlie Zeal at 217/782-2113.

Edwin C Bakowski PE

Edwin C. Bakowski, P.E.
Manager, Permit Section
Division of Air Pollution Control

Date Signed: 7-14-2011

ECB:CZ:psj

cc: Region 3

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
P. O. BOX 19506
SPRINGFIELD, ILLINOIS 62794-9506

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

July 1, 1985

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) authorizes the Environmental Protection Agency to impose conditions on permits which it issues.

The following conditions are applicable unless susperseded by special condition(s).

1. Unless this permit has been extended or it has been voided by a newly issued permit, this permit will expire one year from the date of issuance, unless a continuous program of construction or development on this project has started by such time.

2. The construction or development covered by this permit shall be done in compliance with applicable provisions of the Illinois Environmental Protection Act and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any duly authorized agent of the Agency upon the presentation of credentials, at reasonable times:

   a. to enter the permittee's property where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit,

   b. to have access to and to copy any records required to be kept under the terms and conditions of this permit,

   c. to inspect, including during any hours of operation of equipment constructed or operated under this permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this permit,

   d. to obtain and remove samples of any discharge or emissions of pollutants, and

   e. to enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located,

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities,

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations,

   d. does not take into consideration or attest to the structural stability of any units or parts of the project, and

e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. a. Unless a joint construction/operation permit has been issued, a permit for operation shall be obtained from the Agency before the equipment covered by this permit is placed into operation.

   b. For purposes of shakedown and testing, unless otherwise specified by a special permit condition, the equipment covered under this permit may be operated for a period not to exceed thirty (30) days.

7. The Agency may file a complaint with the Board for modification, suspension or revocation of a permit:

   a. upon discovery that the permit application contained misrepresentations, misinformation or false statements or that all relevant facts were not disclosed, or

   b. upon finding that any standard or special conditions have been violated, or

   c. upon any violations of the Environmental Protection Act or any regulation effective thereunder as a result of the construction or development authorized by this permit.

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
P.O. BOX 19506
SPRINGFIELD, ILLINOIS 62794-9506

STANDARD CONDITIONS FOR LIFETIME OPERATING PERMITS

July 1, 1998

The Illinois Environmental Protection Act [415 ILCS 5/39 (formerly Illinois Revised Statutes, Chapter 111-1/2, Section 1039)] grants the Illinois Environmental Protection Agency authority to impose conditions on permits which it issues.

1. The issuance of this Permit does not release the Permittee from compliance with state and federal regulations which are part of the Illinois State Implementation Plan, as well as with other applicable statues and regulations of the United States or the State of Illinois or with applicable local laws, ordinances and regulations.

2. The Illinois EPA has issued this Permit based upon the information submitted by the Permittee in the permit application. Any misinformation, false statement or misrepresentation in the application shall be ground for revocation under 35 Ill. Adm. Code 201.166.

3. a. The Permittee shall not authorize, cause, direct or allow any modification, as defined in 35 Ill. Adm. Code 201.102, of equipment, operations or practices which are reflected in the permit application as submitted, until the appropriate permit is obtained from the Illinois EPA.

   b. The Permittee shall obtain a new or revised permit under Section 39.5 of the Act, if the source no longer meets the applicability criteria of 35 Ill. Adm. Code 201169 because of changes in emissions units or control equipment.

   c. The Permittee shall obtain a revised permit prior to any of the following changes at the source:

      i. An increase in emissions above the amount the emission unit or the source is permitted to emit; or

      ii. A modification; or

      iii. A change in operations that will result in the source's noncompliance with a condition in the existing permit; or

      iv. A change in ownership, company name, or address, so that the application or existing permit is no longer accurate.

4. a. This Permit only covers emission units and control equipment while physically present at the indicated source location. Unless the Permit specifically provides for equipment relocation, this Permit is void for n item of equipment on the day it is removed from the permitted location, or if all equipment is removed.

   b. The Permittee shall notify the Illinois EPA in writing to withdraw the Permit if all operations the source have been permanently discontinued.

5. The Permittee shall allow any duly authorized agent of the Illinois EPA, upon the presentation of credentials, at reasonable times:

   a. To enter the Permittee's property where actual or potential effluent, emission or noise units are located or where any activity is to be conducted, pursuant to this Permit;

   b. To have access to and to copy any records required to be kept under the terms and conditions of this Permit;

   c. To inspect, including during any hours of operation of equipment constructed or operated under this Permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this Permit;

   d. To obtain and remove samples of any discharge or emission of pollutants; and

   e. To enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring or recording any activity, discharge or emission authorized by this Permit.

6. The issuance of this Permit:

   a. Shall not be considered as in any manner affecting the title of the premises upon which the permitted source is located;

   b. Does not release the Permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the source;

   c. Does not take into consideration or attest to the structural stability of any unit or part of the project; and

   d. In no manner implies or suggests that the Illinois EPA (or its officers, agents, or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or source.

7. The Permittee shall maintain all equipment covered under this Permit in such a manner that the performance of such equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereuner.

8. The Permittee shall maintain a maintenance record on the premises for each item of air pollution control equipment. This records shall be made available to any agent of the Illinois EPA at any time during normal working hours and/or operating hours. As a minimum, this record shall show the dates of performance and nature of preventative maintenance activities.

9. No person shall cause or allow startup of any emission unit or continued operation during malfunction or breakdown of any emission unit or related air pollution control equipment if such startup or continued operation would cause a violation of an applicable emission standard or permit limitation if such operation is not allowed as a special condition of this Permit, as required by 35 Ill. Adm. Code 201.149.

10. The Permittee shall submit an Annual Emission Report as required by 35 Ill. Adm. Code 201.302 and 35 Ill. Adm. Code Part 254.

11. The Permittee shall pay the annual site fee for the source in accordance with Section 9.5 of the Act.

For assistance in preparing a permit application contact the Permit Section,

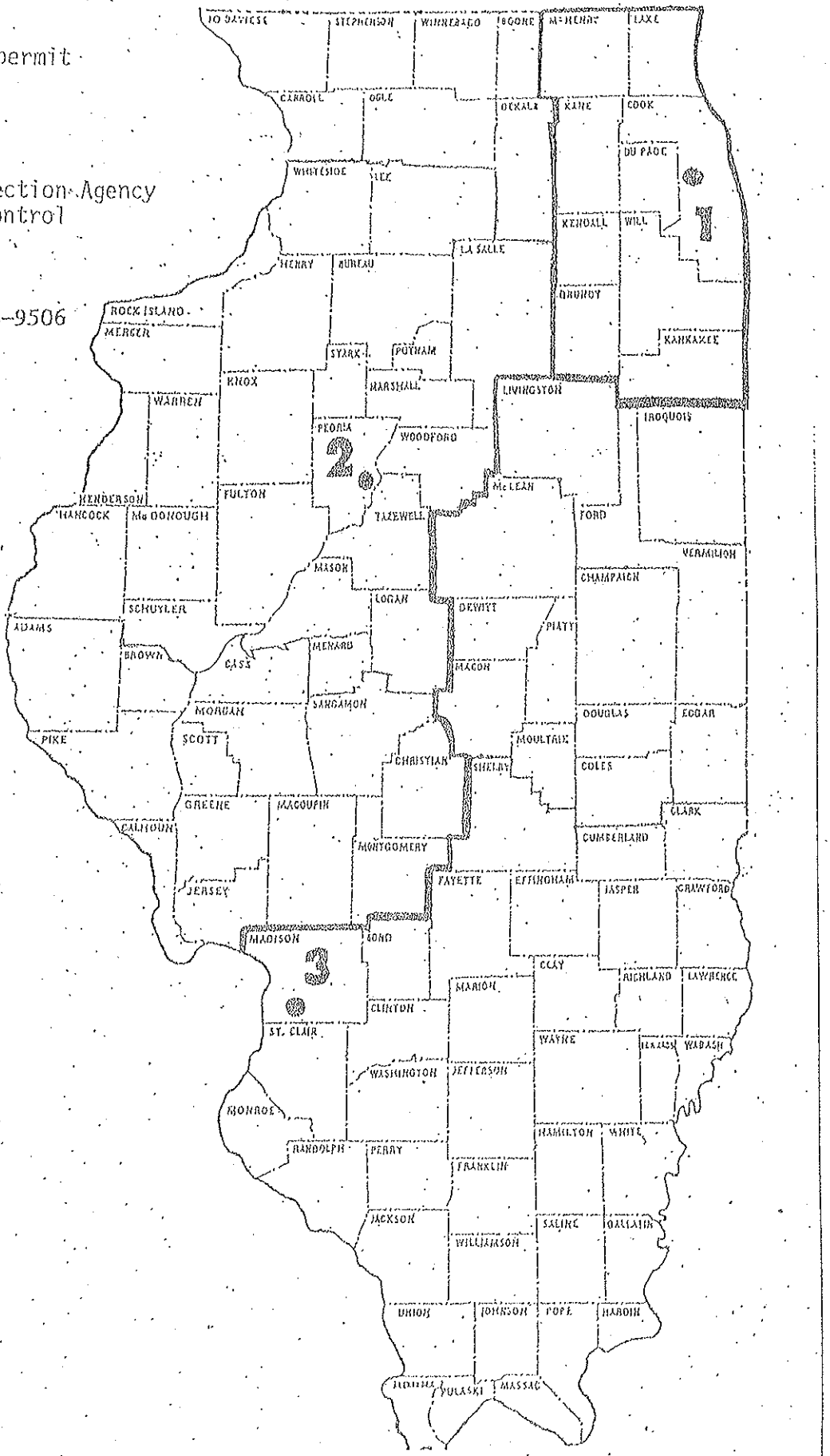
Illinois Environmental Protection Agency
Division of Air Pollution Control
Permit Section
1021 N. Grand Ave E.
P.O.Box 19506
Springfield, Illinois 62794-9506

or a regional office of the Field Operations Section. The regional offices and their areas of responsibility are shown on the map. The addresses and telephone numbers of the regional offices are as follows:

Illinois EPA
Region 1
Bureau of air, FOS
9511 West Harrison
Des Plaines, Illinois 60016
847/294-4000

Illinois EPA
Region 2
5415 North University
Peoria, Illinois 61614
309/693-5463

Illinois EPA
Region 3
2009 Mall Street
Collinsville, Illinois 62234
618/346-5120



APPENDIX P AST Certification

URS

Assessment of Tank Systems
Equilon Enterprises LLC d/b/a Shell Oil Products
Roxana, Illinois
March 29, 2013

General

An assessment of the Aboveground Storage Tank (AST) systems associated with two Soil Vapor Extraction (SVE) systems was performed. The SVE systems and their associated tanks are the Public Works leg (Storage Tank #1) and the West Fenceline leg (Storage Tank #2) associated with the Wood River Refinery. This assessment was a review of the tank systems with respect to the systems' structural integrity and acceptability for the storage and treatment of hazardous waste.

Tank System Description

The tank systems consist of two groups of SVE wells, one group along the west fenceline of the Wood River Refinery and the other group in the Village Public Works property. The vapors from these wells are piped to an enclosure housing the system equipment for both systems, on refinery property. The ASTs are just outside the enclosure, with both the enclosure and the ASTs set on a common concrete slab. Liquid from vapor/liquid separators in the enclosure drains to the ASTs.

The effluent from the vapor/liquid separators will contain a solution of benzene and water. Benzene is a known carcinogen and is considered hazardous upon prolonged exposure. An uncontained spill resulting from failure of components of this system would require remediation of the area where the spill occurred.

Tank System Assessment

The systems covered by this certification consists of the liquid piping to the tanks and the two tanks. The effectiveness of the systems in collecting and processing the waste was not part of this review. Likewise, the equipment and piping handling the vapor containing the waste were not part of this review.

---System Design: The system design as depicted on the P&ID was reviewed for general compliance with good engineering practices for a system treating and storing hazardous waste. The systems are designed to avoid overfilling the tanks, with level indicators on the tanks and high level alarms. The tanks are vented to atmosphere to prevent overpressure or failure due to vacuum.

---Secondary Containment: Secondary containment of the waste is provided via the double-walled tanks. The interstitial containment area is monitored daily to confirm that a vacuum is maintained within the space between the tank walls.

URS Corporation
1500 West 3rd Street, Suite 200
Cleveland, OH 44113-1406
Tel: 216.523.5600
Fax: 216.523.5922
www.urscorp.com

---Storage Tanks: The Storage Tanks are above-ground double-walled steel tanks. The tanks are constructed to the Canadian Code ULC CAN/ULC-S601-07, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids, and S652-08, Collection of Used Oil Tank Assembly. The Canadian code is the equivalent of UL-142. These codes are customarily used for storage tanks in this type of service.

The tanks have no nozzles below the liquid level, thus there are no means of leakage via nozzles or tank piping.

---Storage Tank Foundation: The Storage Tanks are not supported on foundations as such but are supported by a 12" thick reinforced concrete slab, with 8" of granular fill beneath. The assessment of the adequacy of the slab design to accommodate the tanks' weight and seismic effects are on file. Frost heave is not a factor with this slab design.

---Chemical Compatibility: The primary material in contact with the benzene/water effluent is carbon steel. This is a recommended material for use in this service.

Summary of Assessment

In the opinion of the writer of this assessment, Mark Gnandt, this system is adequately designed, has sufficient structural integrity, and is acceptable for storage and treatment of the hazardous waste it is designed to handle.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Mark Gnandt

Mark Gnandt
Professional Engineer, Illinois
License Number 062-053842

APPENDIX Q SVE System Inspection Sheets

ROXANA SVE SYSTEM DATA SHEET

Date _____

Time _____

Personnel _____

Ambient Temp _____ Barometric Pressure _____

HMI READINGS

Cold Face #1	°F	Cold Face #2	°F		
Chamber #1	°F	Chamber #2	°F	Median	°F
Stack Temp	°F	HGB	%	NG	%
FA Damper #1	%	FA Damper #2	%		

INTRUMENT READINGS

WFL Vac	in/wc	WFL Temp	°F	dp
PW Vac	in/wc	PW Temp	°F	dp
Stack Vac	in/wc	Stack DP	in/wc	

SVE LEGS

Brown	°F	**Purple**	°F	**Red**	°F
	in/wc		in/wc		in/wc
	dp		dp		dp
Blue	°F	**Green**	°F	**Teal**	°F
	in/wc		in/wc		in/wc
	dp		dp		dp

DILUTION (% open)

PW	%	WFL #1 (S)	%	WFL#2 (N)	%
Manual	%				

ASTs

WFL	in/hg	**PW**	in/hg

Natural Gas Consumption

Meter Reading _____ (Mon, Wed, and Fri) **Hour Meter** _____

Location	DTP	DTW	DTB
Sump			
AST #1			
AST #2			

SUPPLEMENTARY DILUTION VALVES

WFN	°F	**WFS**	°F	**PW**	°F
	in/wc		in/wc		in/wc
	dp		dp		dp

VLS READINGS

WFL Site Glass	in	**PW Site Glass**	in
WF Before	in/wc	**WF After**	in/wc
PW Before	in/wc	**PW After**	in/wc

ASTs

WF	in	**PW**	in

File this sheet in Compliance Folder maintained at the RTO, Copy George Jones: Revision date 12/10/13

ROXANA SVE SYSTEM WEEKLY INSPECTION FORM Date _____

Personnel _____ Time _____

RTO UNIT

RTO Housing free of any visible cracks or defects? YES / NO

Natural Gas Line free of any visible defects or leaks? YES / NO

System and combustion motors free of leaks and/or any abnormal noises? YES / NO

System and combustion belts appear tight and show no signs of fray? YES / NO

Mixing Box free of any visible cracking due to vibration? YES / NO

Fresh air dampers operating properly? YES / NO

ASTs

Both ASTs and associated piping free of visible leaking? YES / NO

Emergency pressure valve operational? YES / NO

Volume depth counter operating correctly? YES / NO

Secondary containment vacuum AST #1 _____ AST #2 _____

BLOWER UNIT

Blower motor free of leaks and/or any abnormal noises? YES / NO

Gravity feed mineral oil volume 50% or greater? YES / NO

Blower motor oil visible in sight glass and appears clean? YES / NO

Blower motor belt appears tight and shows no sign of fray? YES / NO

VLS UNITS

Both VLSs and associated piping free of visible leaking? YES / NO

Sight glass interior is visible with no visible obstructions? YES / NO

COMPRESSOR

Compressor motor oil visible in sight glass and appears clean? YES / NO

Condensation collection vessel empty? YES / NO

Lines running to and from unit free of any visible leaks? YES / NO

* If the answer to any of the above questions was NO, please explain.

_____

_____

_____

_____

_____

_____

File this sheet in Compliance Folder maintained at the RTO, Copy George Jones: Revision date 5/10/13